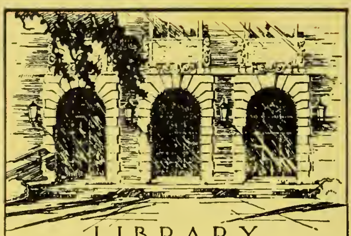

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SCHOOL of ENGINEERING

CO-OPERATIVE SYSTEM

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VOLUME 6 JUNE 15, 1910 NUMBER 7

SCHOOL OF ENGINEERING

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ISSUED SEMI-MONTHLY

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CO-OPERATIVE PLAN OF ENGINEERING INSTRUCTION

The technical graduate who has taken school work only has no adequate knowledge of the organization which makes it possible for many men of diverse employment to work together as a single unit in the accomplishment of a desired result, or the system that is necessary for tying together inter-related departments for the attainment of economic production; nor does he even know as a beginner how to apply the knowledge gained at school in a manner altogether satisfactory to his employer.

Because of this unpreparedness of the average technical graduate, a number of large corporations have established student apprenticeship courses for the benefit of such graduates as seek employment with them.

The engineering schools and the companies who employ their graduates are thus working independently in their efforts to prepare young men for entrance upon their life's work. Since both school and future employer have the common aim to fit the young man for efficient service at the minimum of cost in time and money, it is evident that the best results cannot be had by independent action but by co-operation.

The University of Pittsburgh because of its splendid industrial environment is most favorably situated to apply this co-operative principle to the education of young men who are preparing to enter the engineering industries. Instead of keeping the young man away from the actualities of his life's work for a period of four or more years prior to graduation, as is the general custom of engineering schools, the Faculty of the School of Engineering have matured a co-operative plan whereby the student, while spending in school the amount of time usually devoted to instruction in our best engineering institutions will work four terms of three months each, in the engineering industries of the Pittsburgh District. By this plan the student gets the usual theoretical course and in addition twelve months of practical work, all in the space of four years, the school work being arranged so that successive groups of students will furnish continuous service to the employer.

As compared with the engineering student who takes the school work only, he will be the gainer in the following respects:

1. Because of the opportunities to observe in detail the methods of production and the conduct of business, and the results of his contact with the men who are carrying on our engineering industries, he will be able to do his school work more effectively.

2. For the same reasons, he will upon graduation be of greater use to his employer. Indeed many graduates will find good positions where they have done practical work on this co-operative plan, which they can fill satisfactorily from the start. In this regard the graduate who takes his course on the co-operative plan will possess a distinct advantage over the graduate who has taken school work only.

3. The money consideration received for this practical work will be ordinarily sufficient to meet the tuition expenses for his entire course at the University. In all cases the student of engineering will be materially benefited by thus early learning from actual experience the view point of the wage earner; and the money received will be to many students an item of no small importance.

Courses in Civil, Mechanical, Electrical, Chemical, and Sanitary Engineering are offered by the School of Engineering of the University, in all of which there is incorporated the principle of co-operation. These five courses are arranged so as to be identical for the first three terms. This permits of developing the student to a certain extent along lines which are common to all engineering before requiring him to choose the specific course he is to pursue. These first three terms are looked upon as a probationary period in the sense that the nature of the work done by any particular student during this period will determine in the judgment of the faculty whether or not he is to be advised to continue in the School of Engineering.

If the nature of his work shows that he will profit by remaining in the school, then the specific course he shall take will be decided in consultation with the Dean at the end of this probationary period.

WORK IN THE ENGINEERING INDUSTRIES OF THE PITTSBURGH DISTRICT

This work is conducted under actual commercial conditions and covers four terms of three months each, distributed through the middle of the student's course at the University.

The purpose of this work is to give the student of engineering an understanding of the conditions and methods of the practical side of the profession which he expects to follow after graduation. This can only be obtained by actual contact with the engineering industries, and should be acquired at the earliest possible date. The student works side by side with other employees, and gets an insight into labor conditions. He has the opportunity to observe in detail the methods of carrying on engineering work and the conduct of business from the productive standpoint, and learns much of value in his formative years which cannot be had from either his professors or books.

While the University has made special arrangements with a number of our local concerns for the benefit of its engineering students, and will co-operate with the management of these concerns in every way possible, yet the student will be considered as a direct employee of the concern. He will serve as a regular employee for six regulation working days each week for which he will receive the regular wages of a student apprentice, and will be expected to observe strictly the rules and regulations of the company, and to work under existing labor laws and conditions, including those pertaining to liability for accidents.

This industrial practice will be arranged so that the student will have an opportunity, as far as practicable, to engage in work pertaining to that phase of engineering in which he may be particularly interested.

The student will report to the proper instructor at the University one evening each alternate week for discussion of the work being done; and at the end of the term he will receive twenty credits when a written report of his work and observations during the term has been received and accepted by the instructor in charge.

EQUIPMENT

The buildings of the University are new and embody the latest ideas of design in class-rooms, drafting-rooms, laboratories, etc. Four large and well equipped rooms are provided for drafting and design work. The laboratories are all newly equipped and the latest types of equipment are constantly being added.

FIELD-INSTRUMENT EQUIPMENT

This equipment, which has recently been largely augmented, includes a large assortment of the various types and makes of instruments used in land surveying, railroad surveying, construction work, leveling and geodetic surveying. The instruction of the student in the care, adjustment and use of the various types of instruments has been kept clearly in mind and well provided for in the selection of equipment. The Allegheny Observatory, which is the Astronomical Department of the University, affords exceptional advantages for students who desire to specialize in Geodetic or Astronomical work.

MATERIALS TESTING LABORATORY

This laboratory is equipped with machines and instruments for the measurement of the physical properties of the materials of construction, and for tests on manufactured specimens.

There are three universial testing machines, ranging from 50,000 lbs. to 200,000 lbs. capacity, for tension, compression, and flexure tests. The 200,000 lbs. capacity machine is capable of taking 15 foot columns, tension specimens accordingly, and flexure specimens up to 20 ft. lengths.

A 230,000 inch pounds torsion machine, with a three inch chucking capacity, and for lengths up to 15 feet; a hand power flexure machine of 5,000 lbs. capacity; two automatic briquette testing machines, standard molds, scales, sieves, moist closet and other similar apparatus necessary for the examination of cements, cement mortars and concrete.

In addition to the above mentioned machines and apparatus, there will be provided a punch and shear machine, together with pneumatic tools for doing experimental fabrication work.

HYDRAULIC LABORATORY

For hydraulic experiments there are a Worthington two stage turbine pump driven by variable speed motor, a Pelton wheel, and receiving and measuring tanks with weir discharge. There are also water meters, orifices, nozzles, and a Venturi meter for determining the flow of liquids.

STEAM AND POWER LABORATORY

There is provided the usual equipment for measuring the pressure, temperature, and flow of steam, such as gauges, thermometers, calorimeters, condensers, and indicators, and meters together with suitable apparatus for standardizing and calibrating these.

A Babcock & Wilcox 100 H. P. 200 lb. pressure boiler, with a superheating chamber, for use in experimental and power-plant work.

A composite cross compound steam Engine, 7½ and 18 by 14 inches, arranged to run condensing or noncondensing; high pressure cylinder controlled by single valve, low pressure cylinder controlled by four Corliss type valves. Engine is provided with friction brake, which serves for applying loads and for measuring the power delivered at the wheel; and is arranged so that either side may be operated as a simple engine condensing or non-condensing.

A two cylinder Westinghouse gas engine, provided with all necessary apparatus for making gas engine tests; to be used for experimental purposes. In addition to this there are two three-cylinder Westinghouse gas engines for power purposes located in the laboratory.

A motor-driven air-compressor furnishing air for laboratory needs, and arranged for use in experimental work.

DYNAMO LABORATORY

The dynamo room of the Electrical laboratory contains the usual equipment of direct current and alternating current motors and generators, and transformers, of different makes and capacity. This includes direct current generators, constant and variable speed direct current motors, single phase and polyphase induction motors, single phase series motors, two phase and three phase synchronous converters, a. c-d. c. motor-generator set, and a General Electric mercury arc rectifier. In addition to the above there is available for special work, the two 37.5 k. w. direct connected gas engine driven generators, and the large motor-generator set consisting of a 150 h. p. 2-phase induction motor direct connected to a 100 k. w. 220 volt three wire generator, belonging to the University power plant. The laboratory is well equipped with accessory apparatus, such as measuring instruments, brakes, load and starting rheostats, dynomometers, induction regulators, etc. A large floor crane facilitates the rapid and convenient arrangement of apparatus for the different tests, while a well appointed three panel switch board distributes power of the desired kind and voltage to any part of the laboratory.

ELECTRICAL STANDARDIZING LABORATORY

One room is set apart for accurate work in standardizing the apparatus used in the electrical tests. This room is supplied with power by means of special circuits and a special distributing panel, and is equipped with standards of resistance, inductance, and capacity. A Weston laboratory standard voltmeter and a certified Wolff potentiometer permit of rapid and accurate calibration of the measuring instruments. The usual complement of galvanometers, keys, switches, etc., is at hand.

PHOTOMETRICAL LABORATORY

A dark room is equipped with a ten foot photometer bench, a universal rotator of the National Bureau of Standards type, a Hefner primary standard of illuminating power with secondary standard calibrated by the Electrical Testing Laboratory, Bunsen screen, etc., for making complete tests of all kind of incandescent lamps, with and without shades.

SPECIAL ELECTRICAL APPARATUS

A 50,000 volt high tension testing transformer is being installed and when completed will permit of valuable experimental and research work by the student. Last year a new storage battery consisting of sixty-one 120 ampere hour cells was purchased and is available for use at all times. This insures a constant and steady source of e. m. f. and current for all accurate work.

PRACTICAL MECHANICS EQUIPMENT

For Pattern work the equipment consists of wood working machinery, modern work benches and tools necessary for pattern work.

For Foundry work the equipment consists of the best modern types of melting furnaces with necessary apparatus for instruction in the principles of molding, core making, etc.

For Forge work there are special forges and furnaces, of gas and coal fired types, including annealing, hardening and tempering furnaces, a special barium chloride furnace for the treatment of high-speed steels and a 100 pound air hammer.

For Machine work there are modern belt and motor driven machines, including screw-cutting lathes, speed lathes, milling machines, planer, shaper, drill-presses, grinding machines, power hacksaw, and necessary accessory tools, etc.

METHODS OF ADMISSION

Admission is by one of the following methods:

1. EXAMINATION. Examinations are held at the University, beginning at 9 o'clock in the morning on the three days following the Commencement in June, and on the three days preceding the opening of the College year in September. For 1910 these fall on June 16, 17 and 18, and September 22, 23, and 24.

Certificates of College Entrance Examination Board are accepted in lieu of the entrance examination at the University.

2. CERTIFICATE FROM ACCREDITED SCHOOLS. Instead of examination, certificates from high schools and academies whose work has been approved by the University, and whose courses prepare for the Freshman class will be accepted. The official blank of certificate provided by the University must be used. It may be obtained, by application, from the Registrar.

3. From Other Colleges. Students from other schools whose entrance requirements are equivalent to those of the University of Pittsburgh and which offer equivalent courses of study will be credited with the work they have done in such colleges, and admitted to advanced standing without examination.

REQUIREMENTS FOR ADMISSION

All candidates for admission to the School of Engineering must be at least sixteen years of age and furnish testimonials of good moral character. Those who come from other colleges must present certificates of regular dismission.

The student applying for admission must offer fifteen units, a unit being a subject in which the work done is the equivalent of four recitations per week of one hour each for one year, or five of three-quarters of an hour each.

For admission to the School of Engineering the student must offer ten units, in following subjects:

English, *a,* 3 units.
Mathematics, *a, c,* Algebra, 1½ units.
Mathematics, *b, d,* Plane and Solid Geometry, 1½ units.
History, *a, b, c, or d,* 1 unit.
German or French, *a, b,* 2 units.
Physics, 1 unit.

Five additional units must be offered from following subjects:

Chemistry, 1 unit.
Biology, 1 unit.
Drawing, 1 unit.
Physiography, ½ unit.
Shop Work, 1 unit.
Advanced History, 1 unit.
Advanced English, 1 unit.
Latin, *a, b,* 1 to 2 units.
German, 2 units.
French, 2 units.

EXPLANATION OF REQUIREMENTS FOR ADMISSION

The following subjects are accepted for admission:

MATHEMATICS

a. Algebra Through Quadratics

One unit. The four fundamental operations for rational algebraic expressions. Factoring, determination of highest common factor and lowest common multiple by factoring. Fractions, including complex fractions, ratio and proportion. Linear equations, both numerical and literal, containing one or more unknown quantities. Problems depending on linear equations. Radicals, including the extraction of the square root of polynominals and of numbers. Exponents, including the fractional negative.

Quadratic equations, both numerical and literal. Simple cases of equations with one or more unknown quantities, that can be solved by the methods of linear or quadratic equations. Problems depending on quadratic equations. The binomial theorem for positive integral exponents.

b. Plane Geometry

One unit. The usual theorems and constructions of the text-books, including the general properties of plane recti-linear figures; the circle, and the measurement of angles; similar polygons; areas; regular polygons and the measurement of the circle. The solution of numerous original exercises. Applications to mensuration.

c. Advanced Algebra

One-half unit. Ratio, proportion and variation, variables and limits, properties of series, including the binominal theorem for exponents of all kinds; the progressions; use of undetermined coefficients; permutations and combinations; logarithms, computation and use; summation of recurring series; method of differences; interpolation.

d. Solid Geometry

One-half unit. The usual theorems and constructions of good textbooks, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including loci problems. Applications to the mensuration of surfaces and solids.

PHYSICS

One unit.

The candidate will be expected to be familiar with the fundamental principles of Physics. A sufficiently extended treatment of the subject may be found in any one of the principal text-books now in use in the secondary schools. Such, for instance, as Milliken and Gale, Carhart and Chute, Hoadley, Mann and Twiss.

It is furthermore very desirable for the student to have received training in laboratory work but for the present no laboratory work will be required.

CHEMISTRY

One unit.

The knowledge gained, if elementary, should be sufficiently comprehensive and exact, including facts and laws. Laboratory work, emphasizing descriptive chemistry is necessary and notes of this work must be presented. Much attention should be given to solution of problems.

BIOLOGY

One unit.

Under this one head are grouped the subjects ot Botany, Zoology and Physiology. The one unit may be made in a single subject or by any combination of two. Laboratory exercises or field work, equal in time at least to that given to text-book and lecture is essential. In offering subject for credit the names of the text-books used should be given.

PHYSIOGRAPHY

One-half unit.

This subject, otherwise known as Physical Geography, must have been pursued as a special subject and not as a part of the earlier study of general geography, and a standard text-book, dealing with the subject solely, must have been used.

DRAWING

One unit.

Specimens of the work done must be presented, properly certified by the instructor, with a statement of the length of time taken in the course which they represent.

SHOP-WORK

One unit.

The work done must usually have been of the systematic kind prescribed in courses of manual training. Those who have learned, in actual employment, shop-trades, will be as favorably considered as possible.

A statement from instructor, or the applicant, if he has not been under school instruction, setting forth the kind and amount of shopwork done should accompany request for credit in this subject.

HISTORY

One to two units.

(*a*) Ancient history, with special reference to Greek and Roman history, and including also a short introductory study of the more ancient nations and the chief events of the early Middle Ages, down to the death of Charlemagne (814).

(*b*) Mediæval and modern European history, from the death of Charlemagne to the present time.

(*c*) English history.

(*d*) American history and civil government.

Each of the above topics is intended to represent one year of historical work, wherein the study is given five times per week, or two years of historical work, wherein the study is given three times per week.

ENGLISH COMPOSITION AND LITERATURE

a. Three units. The preparation should include the following subjects:

1. Grammar—It is expected that the applicant will be familiar with the essentials of English grammar, and will be able to explain the construction of sentences that occur in the literature he has read.

2. Composition and Rhetoric—The student should know the elementary principles of Rhetoric, and should be able to apply them in the construction of sentences and paragraphs, and in the planning of essays. The examination is chiefly practical, and involves the ability to write good English.

No student will be accepted whose paper is notably deficient in logical development of the subject, or in such details of form as spelling, punctuation, grammar, and division into paragraphs.

3. Literature—The books recommended are the Uniform College Entrance requirements in English. Other similar works will be accepted as equivalents.

The candidate is required to write one or more paragraphs on each of several subjects chosen from a considerably larger number given in the examination paper. The questions on all the books assume a knowledge of subject-matter and structure, but those on the books prescribed for study and practice call for more detailed treatment than those on books prescribed for reading.

A—The books prescribed for reading and practice are:

Select two sub-divisions from each of the following groups, except when substitution is made from Group 2-5, as provided below. Each sub-division is set off by semicolons.

Group 1. The Old Testament, including the most important narrative parts of Genesis, Exodus, Joshua, Judges, Samuel, Kings, and Daniel, together with the books of Ruth and Esther; the Odyssey, with the omission of Books I-V, XV-XVII; the Iliad with the omission of Books XI, XIII-XV, XXI; Virgil's Aeneid. English translations of the Odyssey, the Iliad, and the Aeneid, of acknowledged literary merit, must be used.

An equivalent amount from Groups 2-5 may be substituted for the above.

Group 2. Shakespeare's *Julius Caesar; The Merchant of Venice; As You Like It; A Mid-Summer-Night's Dream; Twelfth Night; Henry V.*

Group 3. Goldsmith's *The Vicar of Wakefield;* either Scott's *Ivanhoe* or Scott's *Quentin Durward;* Hawthorne's *The House of the Seven Gables;* Thackeray's *Henry Esmond;* either Dickens's *A Tale of Two Cities,* or Dickens's *David Copperfield;* Mrs. Gaskell's *Cranford;* George Eliot's *Silas Marner;* Stevenson's *Treasure Island;* Defoe's *Robinson Crusoe,* Part I.

Group 4. The de Coverley Papers in *The Spectator;* Franklin's *Autobiography;* Bunyan's *Pilgrim's Progress,* Part I; Irving's *Sketch-Book;* Macaulay's Essays on Clive and Hastings; Thackeray's *English Humorists;* selections from Lincoln, including at least the two Inaugurals, the speeches in Independence Hall and at Gettysburg, the *Last Public Address,* and the *Letter to Horace Greeley,* together with a short memoir or estimate; Parkman's *Oregon Trail;* Thoreau's *Walden;* Huxley's *Autobiography* and selections from *Lay Sermons,* including addresses on *Improving Natural Knowledge, A Liberal Education,* and *A Piece of Chalk;* Stevenson's *Inland Voyage* and *Travels with a Donkey.*

Group 5. Palgrave's *Golden Treasury* (First Series), Books II and III, with special attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's *Elegy in a Country Churchyard* and Goldsmith's *The Deserted Village;* Coleridge's *The Ancient Mariner* and Lowell's *The Vision of Sir Launfal;* Scott's *The Lady of the Lake;* Byron's *Childe Harold, Canto* IV, and *The Prisoner of Chillon;* Palgrave's *Golden Treasury,* (First Series), Book IV, with special reference to Wordsworth, Keats and Shelley; Poe's *The Raven;* Longfellow's *The Courtship of Miles Standish,* and Whittier's *Snow-Bound;* Macaulay's *Lays* *of Ancient Rome,* and Arnold's *Sohrab and Rustum;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, Herve Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City.*

B. The books prescribed for study and practice are:

Shakespeare's *Macbeth;* Milton's *Lycidas, Comus, L'Allegro,* and *Il Penseroso;* Burke's Speech on *Conciliation with America,* or Washington's *Farewell Address,* and Webster's *First Bunker Hill Oration;* Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns.*

Applicants who are not graduates of accredited high-schools, or who have not passed the uniform entrance examinations, will be required to present themselves at the University of Pittsburgh entrance examinations, held the three days preceding the opening of the Fall term.

b. One unit.

Advanced standing in English may be given to the graduates of high-schools that have exceptionally strong and thorough courses in English throughout the entire four years. This requires additional work in literature and, especially, a thorough knowledge of the elementary principles of Rhetoric, and the ability to write good English.

GERMAN

One unit each.

a. Elementary German. During the first year the work should comprise (1) careful drill upon pronunciation; (2) the memorizing and frequent repetition of easy colloquial sentences; (3) drill upon the rudiments of grammar; (4) abundant easy exercises designed, not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (5) the reading from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lessons.

b. Second Year German. During the second year the work should comprise (1) the reading of from 150 to 200 pages of literature in the form of easy stories and plays; (2) practice as before, in the translation into German of easy variations upon the matter read, and also in the reproduction, orally and in writing, of the substance of short and easy selected passages; (3) continued drill upon the rudiments of Grammar.

Stories suitable for the elementary course can be selected from the following list: Grimms' *Maerchen,* Gerstaecker's *Germelshausen,* Heyse's

L'Arrabbiata, Storm's *Immensee,* Baumbach's *Der Schwiergersohn,* Schokke's *Der Zerbrochene Krug,* Hillern's *Hoeher als Die Kirche.*

Among shorter plays the best available are perhaps: Benedix's *Der Prozess, Der Weiberfreund;* Elz's *Er ist nich eifersuechtig;* Wichert's *An der Majorsecke;* Wilhelm's *Einer muss heiraten.*

c. Third Year German. The work should comprise the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tenses and modes, and likewise upon word-order and word formation.

Suitable reading matter for the third year can be selected from such works as the following: Freytag's *Die Journalisten* and *Bilder aus der Deutschen Vergangenheit,* for example, *Karl der Grosse, Aus den Kreuzzuegen, Doktor Luther, Aus dem Staat Friedrichs des Grossen,* Gerstaecker's *Irrfahrten,* Hoffman's *Historische Erzaehlungen,* Riehl's *Der Fluch der Schoenheit,* Schiller's *Wilhelm Tell, Der Neffe als Onkel, Das Lied von der Glocke,* Wildenbruch's *Das edle Blut.*

FRENCH

One unit each.

a. Elementary French. In the first year the work should comprise (1) careful drill in pronunciation; (2) the rudiments of grammar; (3) easy composition; (4) the reading of from 150 to 200 pages of easy French prose; (5) writing French from dictation.

b. Second Year French. During the second year the student should read from 300 to 400 pages of easy modern prose. Suitable texts are:

Halévy's *L'Abbé Constantin;* Bruno's *Le tour de la France;* Malot's *Sans famille;* Labiche and Martin's *La poudre aux yeux and Le voyage de M. Perrichon;* Dumas' *L'Evasion du Duc de Beaufort.* Continued drill upon the rudiments of grammar, the mastery of the chief irregular verbs, dictation, practice in French conversation.

c. Third Year French. In the third year from 500 to 600 pages of French of ordinary difficulty should be read. The essentials of French snytax are required, with constant practice in the use of spoken French. Suitable texts are: Daudet's *Contes;* About's *Le Roi des Montagnes;* Merrimée's *Colomba;* Augier's *Le Gendre de M. Poirier;* Moliere's *Le Bourgeois Gentilhomme;* Maupassant's *Contes;* George Sand's *La Mare au Diable;* Scribe's plays.

LATIN

One unit each.

a. Grammar and elementary prose composition; a thorough knowledge of all regular inflections, all common irregular forms, the fundamentals of syntax and a select vocabulary.

b. Cæsar, Gallic War, books I-IV, or the equivalent from other books of the Gallic War or the Civil War, or Nepos, Lives. The examination consists of translation at sight of narrative prose similar to the above.

c. Cicero, the four orations against Catiline and the orations for Archias and for the Manilian Law, or the equivalent from other orations of Cicero or from his letters, or from Sallust, Catiline and Jugurtha, except that the orations for the Manilian Law and for Archias are required. Advanced prose composition. The examination consists of translation (together with historical, literary and grammatical questions) partly of passages taken from the two required orations, and partly at sight of passages similar to the above in vocabulary, syntax and range of ideas. In addition, there is an examination in prose composition.

d. Virgil, Aeneid, books I-VI, or the equivalent from other books of the Aeneid, or from the Bucolics or Georgics, or from Ovid, Metamorphoses, Fasti, or Tristia, except that Aeneid, I, II and either IV or VI are required. The examination consists of translation (together with questions on grammar, prosody, literary and historical allusions and subject-matter) partly of passages taken from the required books, and partly at sight of passages similar to the above in vocabulary, syntax and range of ideas.

TUITION AND FEES

The tuition covers all fees except those specified below:

TUITION—

First, fourth, seventh and ninth terms, each	$ 40.00
All other terms, each	35.00
If paid in advance for three (3) terms	105.00

Tuition must be paid upon registration, and before name can be entered on class rolls.

FEES—

Matriculation, payable on admission to University	$ 5.00
Diploma	5.00
Gymnasium, each term	2.00
Chemistry, each course	5.00
Biology, course 3	1.75
Biology, each additional course	3.50
Engineering Laboratory, each term	5.00
Shop, each term	5.00
Breakage Deposit	15.00

SUBSTITUTES

The courses in engineering have been prepared with the view of meeting fully the requirements of the majority of those who desire to pursue courses in engineering. However, for those who desire it, equivalent substitutes will be allowed when approved by the head of the department in which the student is entered.

In order to have a substitute allowed, application must be made to the head of the department at least two weeks before the beginning of the term in which the course is scheduled. Substitutes will be allowed only in case the student has satisfactorily completed the necessary prerequisites.

ADVANCED STANDING IN ENGINEERING COURSES

Graduates of the College of this University, or of any other college of high standing, who desire to prepare themselves for the engineering profession, will be matriculated in the School of Engineering upon presentation of their diplomas and evidence that they have pursued mathematical and scientific studies justifying their entering one of the advanced classes. By availing themselves of this provision graduates from classical or general scientific courses may obtain a professional training in engineering in two or three years after taking a first degree, and may enter upon their practical work with a broader education than can be obtained by taking a regular engineering course. Students of the University, in the College, will be advised as to the best selection of electives to make, to the end that they may enter an engineering course for an additional degree at as high a point as possible and with the fewest conditions.

DEGREES IN ENGINEERING

The degrees conferred upon those who shall complete satisfactorily the courses offered by the School of Engineering will be respectively:

Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, Bachelor of Science in Electrical Engineering, Bachelor of Science in Chemical Engineering, Bachelor of Science in Sanitary Engineering.

Upon giving evidence of having successfully practiced engineering for a period of at least three years, accompanied by a satisfactory thesis showing the application of engineering principles to some important project, the corresponding engineering degree will be conferred upon graduates of this school.

COURSES IN ENGINEERING

The Courses in Engineering are made up of eleven terms of eleven to twelve weeks each spent in school, which are numbered continuously and four terms spent in the engineering industries of the Pittsburgh district; making a total of fifteen terms' work required for graduation. The practice terms are each three full calendar months in length, and are designated as P1, P2, P3, and P4.

The schedule of work in the co-operative plan adopted is as follows: During the first three terms, the middle term, and the last three terms of the course all students of the same class are together in school; while during the rest of the time each class is divided into two sections, which alternate quarterly between school and practical work. Each section doing practical work is further divided into two sections in order to furnish continuous service in any particular kind of engineering employment and at the same time permitting each student to have a greater variety of practical work. This is shown in the following Schedule of Work on Co-operative Plan for classes entering School of Engineering in the Fall of 1910:

1910-11				1911-12				1912-13				1913-14			
Terms				Terms				Terms				Terms			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	2	3	P1	4	P2	5	6	P3	7	P4	8	9	10	11	
			4	P1	5	P2		7	P3	8	P4				

First Term, Sept. 26 to Dec. 17, 1910; Second Term, Jan. 2 to March 25, 1911; Third Term, April 2 to June 17, 1911; Fourth Term, June 26 to Sept. 9, 1911; P1, July 1 to Sept. 30, 1911.

COMMON COURSE IN ENGINEERING

FIRST TERM

Course	No.	Subject	Hrs	Cdts
Mathematics	2	Advanced Algebra	5	5
Chemistry	1	General Chemistry	8	4
Graphics	1	Mechanical Drawing	3	1
Practical Mechanics	1	Frame Work and Pattern Making	7	3
German, 1; or Romance	1	German or French	3	3
English	1	Rhetoric and Composition	3	3
Public Speaking	4	Public Speaking	1	1
Physical Education		Gymnasium	3	1

Second Term

Course	No.	Subject	Hrs	Cdts
Mathematics	5	Trigonometry	3	3
Mathematics	7	Analytic Geometry	2	2
Chemistry	2	General Chemistry	8	4
Graphics	2	Mechanical Drawing	3	1
Practical Mechanics	2	Foundry Work	7	3
German, 2; or Romance	2	German or French	3	3
English	2	Rhetoric and Composition	3	3
Public Speaking	5	Public Speaking	1	1
Physical Education		Gymnasium	3	1

Third Term

Course	No.	Subject	Hrs	Cdts
Mathematics	8	Analytic Geometry	3	3
Civil Engineering	1	Surveying	5	3
Chemistry	8	Qualitative Analysis	8	4
Graphics	3	Mechanical Drawing	6	2
Practical Mechanics	3	Forge Work	3	3
German, 3; or Romance	3	German or French	3	3
English	3	Rhetoric and Composition	2	2
Physical Education		Gymnasium	3	1

COURSE IN CIVIL ENGINEERING

For First Three Terms See Common Course in Engineering.

Fourth Term

Course	No.	Subject	Hrs	Cdts
Mathematics	9	Calculus	4	4
Physics	11	General Physics	7	5
Graphics	4	Sketching and Drafting	6	2
Civil Engineering	2	Topography	7	3
German, 4; or Romance	4	German or French	3	3
English, 15 or	7	English Literature	3	3
Physical Education		Gymnasium	3	1

Fifth Term

Course	No.	Subject	Hrs	Cdts
Mathematics	10	Calculus	4	4
Physics	12	General Physics	7	5
Graphics	5	Descriptive Geometry	8	4
Civil Engineering	3	Topography	3	1
Civil Engineering	19	Current Engineering Topics		1
Biology	3	General Biology	4	2
German, 5; or Romance	5	German or French	3	3
Physical Education		Gymnasium	3	1

Sixth Term

Course	No.	Subject	Hrs	Cdts
Physics	13	General Physics	7	5
Mechanics	1	Analytic Mechanics	5	5
Civil Engineering	5	Railroad Engineering, Location	8	4
Civil Engineering	19	Current Engineering Topics		1
Geology	1	General Geology	5	3
Psychology	11	General Psychology	3	3
Physical Education		Gymnasium	3	1

Course	No.	Subject	Hrs	Cdts
		SEVENTH TERM		
Mechanics	2	Mechanics of Materials	5	5
Mechanics	3	Mechanical Laboratory	6	2
Civil Engineering	6	Railroad Engineering, Construction	4	2
Civil Engineering	19	Current Engineering Topics		1
Mechanics	4	Graphic Statics	7	3
Electrical Engineering	2	Applied Electricity	5	3
Mineralogy	1	Crystallography and Mineralogy	6	2
Economics	3E	Political Economy	3	3
		EIGHTH TERM		
Mechanics	5	Hydro-Mechanics and Hydraulics	4	4
Mechanics	6	Hydraulic Laboratory	3	1
Civil Engineering	7	Masonry Construction	2	2
Civil Engineering	15	Stresses	5	5
Civil Engineering	19	Current Engineering Topics		1
Geology	7	Biological Geology	2	2
Mechanical Engineering	4	Prime Movers	5	3
Astronomy	1		3	3
		NINTH TERM		
Civil Engineering	4	Geodesy	6	4
Civil Engineering	8	Concrete Engineering	3	3
Civil Engineering	9	Structural Laboratory	6	2
Civil Engineering	16	Structural Engineering	10	4
Civil Engineering	19	Current Engineering Topics		1
Civil Engineering	20	Inspection Visits and Reports	3	1
Economics	10	Transportation	2	2
Economics	13	Modern Industries and Industrial Management	2	2
Economics	21	Corporation Finance	2	2
		TENTH TERM		
Civil Engineering	10	Structural Laboratory	6	2
Civil Engineering	11	Arches and Retaining Walls	7	3
Civil Engineering	13	Municipal Engineering	4	2
Civil Engineering	17	Structural Engineering	10	4
Civil Engineering	19	Current Engineering Topics		1
Civil Engineering	20	Inspection Visits and Reports	3	1
Civil Engineering	21	Thesis		2
Economics		Transportation	2	2
Economics	14	Modern Industries and Industrial Management	2	2
Economics	22	Corporation Finance	2	2
		ELEVENTH TERM		
Civil Engineering	12	Roads and Pavements	5	3
Civil Engineering	14	Municipal Engineering	4	2
Civil Engineering	18	Structural Engineering	10	4
Civil Engineering	19	Current Engineering Topics		1
Civil Engineering	20	Inspection Visits and Reports	3	1
Civil Engineering	21	Thesis		4
Economics	46	Contracts and Specifications	3	3
Mechanical Engineering	15	Manufacture and Properties of Iron and Steel	5	3

COURSE IN MECHANICAL ENGINEERING

For First Three Terms See Common Course in Engineering.

Fourth Term

Course	No.	Subject	Hrs	Cdts
Mathematics	9	Calculus	4	4
Physics	11	General Physics	7	5
Graphics	4	Sketching and Drafting	6	2
Practical Mechanics	4	Machine Work in Metals	4	2
German, 4; or Romance	4	German or French	3	3
English, 15 or	7	English Literature	3	3
Physical Education		Gymnasium	3	1

Fifth Term

Course	No.	Subject	Hrs	Cdts
Mathematics	10	Calculus	4	4
Physics	12	General Physics	7	5
Graphics	5	Descriptive Geometry	8	4
Practical Mechanics	5	Machine Work in Metals	4	2
Biology	3	General Biology	4	2
German, 5; or Romance	5	German or French	3	3
Physical Education		Gymnasium	3	1

Sixth Term

Course	No.	Subject	Hrs	Cdts
Physics	13	General Physics	7	5
Mechanics	1	Analytic Mechanics	5	5
Practical Mechanics	6	Machine Work in Metals	4	2
Geology	1	General Geology	5	3
Psychology	11	General Psychology	3	3
German, 6; or Romance	6	German or French	3	3
Physical Education		Gymnasium	3	1

Seventh Term

Course	No.	Subject	Hrs	Cdts
Mechanics	2	Mechanics of Materials	5	5
Mechanical Engineering	1	Kinematics	5	3
Mechanics	3	Mechanical Laboratory	6	2
Mechanics	4	Graphic Statics	7	3
Electrical Engineering	3	Applied Electricity	5	3
Practical Mechanics	7	Investigation Work	3	1
Economics	3E	Political Economy	3	3

Eighth Term

Course	No.	Subject	Hrs	Cdts
Mechanics	5	Hydro-mechanics and Hydraulics	4	4
Mechanics	6	Hydraulic Laboratory	3	1
Mechanical Engineering	2	Machine Design	8	4
Mechanical Engineering	4	Prime Movers	5	3
Electrical Engineering	4	Applied Electricity	5	3
Civil Engineering	7	Masonry Construction	2	2
Physics	15	Advanced Physics	4	2

NINTH TERM

Course	No.	Subject	Hrs	Cdts
Civil Engineering	16	Structural Engineering	10	4
Civil Engineering	9	Structural Laboratory	6	2
Mechanical Engineering	3	Machine Design	7	3
Mechanical Engineering	5	Thermodynamics	4	4
Electrical Engineering	5	Applied Electricity	5	3
Economics	13	Modern Industries and Industrial Management	2	2
Economics	21	Corporation Finance	2	2
Mechanical Engineering	16	Inspection Visits and Reports	3	1
Mechanical Engineering	17	Review of Current Engineering Literature	1	1

TENTH TERM

Course	No.	Subject	Hrs	Cdts
Mechanical Engineering	6	Compressed Air Machinery	2	2
Mechanical Engineering	7	Refrigerating and Ice-making Machinery	1	1
Mechanical Engineering	8	Steam Boilers, Fuels, etc.	5	3
Mechanical Engineering	9	Steam Engines	7	3
Mechanical Engineering	13	Steam Laboratory	6	2
Economics	14	Modern Industries and Industrial Management	2	2
Economics	22	Corporation Finance	2	2
Mechanical Engineering	16	Inspection Visits and Reports	3	1
Mechanical Engineering	17	Review of Current Engineering Literature	1	1
Mechanical Engineering	18	Thesis		3

ELEVENTH TERM

Course	No.	Subject	Hrs	Cdts
Mechanical Engineering	10	Steam Turbines	3	3
Mechanical Engineering	11	Gas Engines and Producers	5	3
Mechanical Engineering	12	Power Plant Engineering	5	3
Mechanical Engineering	14	Power Plant Testing	3	1
Mechanical Engineering	15	Manufacture and Properties of Iron and Steel	5	3
Economics	46	Contracts and Specifications	3	3
Mechanical Engineering	16	Inspection Visits and Reports	3	1
Mechanical Engineering	17	Review of Current Engineering Literature	1	1
Mechanical Engineering	18	Thesis		3

COURSE IN ELECTRICAL ENGINEERING

For First Three Terms See Common Course in Engineering.

FOURTH TERM

Course	No.	Subject	Hrs	Cdts
Mathematics	9	Calculus	4	4
Physics	11	General Physics	7	5
Graphics	4	Sketching and Drafting	6	2
Practical Mechanics	4	Machine Work in Metals	4	2
German, 4; or Romance	4	German or French	3	3
English, 15 or	7	English Literature	3	3
Physical Education		Gymnasium	3	1

FIFTH TERM

Course	No.	Subject	Hrs	Cdts
Mathematics	10	Calculus	4	4
Physics	12	General Physics	7	5
Graphics	5	Descriptive Geometry	8	4
Practical Mechanics	5	Machine Work in Metals	4	2
Biology	3	General Biology	4	2
German, 5; or Romance	5	German or French	3	3
Physical Education		Gymnasium	3	1

SIXTH TERM

Physics	13	General Physics	7	5
Mechanics	1	Analytic Mechanics	5	5
Practical Mechanics	6	Machine Work in Metals	4	2
Geology	1	General Geology	5	3
Psychology	11	General Psychology	3	3
German, 6; or Romance	6	German or French	3	3
Physical Education		Gymnasium	3	1

SEVENTH TERM

Mechanics	2	Mechanics of Materials	5	5
Mechanics	3	Mechanical Laboratory	6	2
Mathematics	11	Differential Equations	2	2
Physics	14	Advanced Physical Laboratory	7	3
Electrical Engineering	1	Dynamo Electric Machinery	5	5
Electrical Engineering	15	Electrical Engineering Laboratory	3	1
Economics	3E	Political Economy	3	3

EIGHTH TERM

Mechanics	5	Hydro-mechanics and Hydraulics	4	4
Mechanics	6	Hydraulic Laboratory	3	1
Electrical Engineering	6	Alternating Current Theory	3	3
Electrical Engineering	16	Electrical Engineering Laboratory	3	1
Mechanical Engineering	2	Machine Design	8	4
Mechanical Engineering	4	Prime Movers	5	3
Physics	15	Advanced Physical Laboratory	7	3

NINTH TERM

Electrical Engineering	7	Alternating Current Machinery	3	3
Electrical Engineering	10	General Electrical Engineering	3	3
Electrical Engineering	13	E. E. Design	8	4
Electrical Engineering	17	E. E. Laboratory	6	2
Electrical Engineering	20	E. E. Seminar	1	1
Mechanical Engineering	5	Thermodynamics	4	4
Economics	13	Modern Industries and Industrial Management	2	2
Economics	21	Corporation Finance	2	2

TENTH TERM

Course	No.	Subject	Hrs	Cdts
Electrical Engineering	8	Alternating Current Machinery	3	3
Electrical Engineering	11	General Electrical Engineering	3	3
Electrical Engineering	14	E. E. Design	8	4
Electrical Engineering	18	E. E. Laboratory	6	2
Electrical Engineering	20	E. E. Seminar	1	1
Electrical Engineering	22	E. E. Thesis	6	2
Economics	14	Modern Industries and Industrial Management	2	2
Economics	22	Corporation Finance	2	2
Electrical Engineering	23	Mathematical Theory of Electricity and Magnetism	3	3

ELEVENTH TERM

Course	No.	Subject	Hrs	Cdts
Electrical Engineering	9	Alternating Current Machinery	3	3
Electrical Engineering	12	General Electrical Engineering	3	3
Electrical Engineering	19	E. E. Laboratory	6	2
Electrical Engineering	20	E. E. Seminar	1	1
Electrical Engineering	22	E. E. Thesis	7	3
Mechanical Engineering	15	Manufacture and Properties of Iron and Steel	5	3
Economics	46	Contracts and Specifications	3	3
Electrical Engineering	24	Mathematical Theory of Electricity and Magnetism	3	3

COURSE IN CHEMICAL ENGINEERING

For First Three Terms See Common Course in Engineering.

FOURTH TERM

Course	No.	Subject	Hrs	Cdts
Mathematics	9	Calculus	4	4
Physics	11	General Physics	7	5
Graphics	4	Sketching and Drafting	6	2
Chemistry	9	Quantitative Analysis	7	3
German, 4; or Romance	4	German or French	3	3
English, 15 or	7	English Literature	3	3
Physical Education		Gymnasium	3	1

FIFTH TERM

Course	No.	Subject	Hrs	Cdts
Mathematics	10	Calculus	4	4
Physics	12	General Physics	7	5
Graphics	5	Descriptive Geometry	8	4
Chemistry	10	Quantitative Analysis	7	3
German, 5; or Romance	5	German or French	3	3
Physical Education		Gymnasium	3	1

SIXTH TERM

Course	No.	Subject	Hrs	Cdts
Physics	13	General Physics	7	5
Mechanics	1	Analytic Mechanics	5	5
Chemistry	11	Quantitative Analysis	7	3
German, 6; or Romance	6	German or French	3	3
Geology	1	General Geology	5	3
Physical Education		Gymnasium	3	1

SEVENTH TERM

Course	No.	Subject	Hrs	Cdts
Mechanics	2	Mechanics of Materials	5	5
Mechanics	3	Mechanical Laboratory	6	2
Chemistry	12	Quantitative Analysis	7	3
Chemistry	15	Organic Chemistry	8	4
Electrical Engineering	3	Applied Electricity	5	3
Physics	14	Advanced Physical Laboratory	4	2
Economics	3E	Political Economy	3	3

EIGHTH TERM

Mechanical Engineering	2	Machine Design	8	4
Electrical Engineering	4	Applied Electricity	8	4
Chemistry	16	Organic Chemistry	8	4
Physics	15	Advanced Physical Laboratory	4	2
Mineralogy	1	Crystallography and Mineralogy	9	3
Mechanical Engineering	4	Prime Movers	5	3

NINTH TERM

Civil Engineering	8	Concrete Engineering	3	3
Electrical Engineering	5	Applied Electricity	5	3
Economics	13	Modern Industries and Industrial Management	2	2
Physics	16	Advanced Physics	3	1
Chemistry	27	Industrial Chemistry	2	2
Mechanical Engineering	5	Thermodynamics	4	4
		Inspection Visits and Reports	3	1
Chemistry	21	Physical Chemistry	2	2

TENTH TERM

Economics	14	Modern Industries and Industrial Management	2	2
Chemistry	28	Industrial Chemistry	2	2
Chemistry	22	Physical Chemistry	2	2
Mechanical Engineering	6	Compressed Air Machinery	2	2
Mechanical Engineering	7	Refrigeration and Ice-making Machinery	1	1
		Thesis		5
		Inspection Visits and Reports	3	1

ELEVENTH TERM

Mechanical Engineering	11	Gas Engines and Producers	5	3
Mechanical Engineering	15	Manufacture and Properties of Iron and Steel	5	3
Economics	46	Contracts and Specifications	3	3
Chemistry	23	Physical Chemistry	2	2
Chemistry	29	Industrial Chemistry	2	2
		Thesis		5
		Inspection Visits and Reports	3	1

COURSE IN SANITARY ENGINEERING

For First Three Terms See Common Course in Engineering.

Fourth Term

Course	No.	Subject	Hrs	Cdts
Mathematics	9	Calculus	4	4
Physics	11	General Physics	7	5
Graphics	4	Mechanical Drawing	6	2
Civil Engineering	2	Topography	7	3
German, 4; or Romance	4	German or French	3	3
English, 15 or	7	English Literature	3	3
Physical Education		Gymnasium	3	1

Fifth Term

Mathematics	10	Calculus	4	4
Physics	12	General Physics	7	5
Graphics	5	Descriptive Geometry	8	4
Civil Engineering	3	Topography	3	1
Chemistry	9	Quantitative Analysis	7	3
Biology	3	General Biology	4	2
Physical Education		Gymnasium	3	1

Sixth Term

Physics	13	General Physics	7	5
Mechanics	1	Analytic Mechanics	5	5
Chemistry	10	Quantitative Analysis	7	3
Geology	1	General Geology	5	3
Psychology	12	General Psychology	3	3
Physical Education		Gymnasium	3	1

Seventh Term

Mechanics	2	Mechanics of Materials	5	5
Mechanics	3	Mechanical Laboratory	6	2
Mechanics	4	Graphic Statics	7	3
Chemistry	34	Water Analysis	6	2
Biology	17	General Bacteriology	7	4
		Personal Hygiene	2	2
Electrical Engineering	3	Applied Electricity	5	3

Eighth Term

Mechanics	5	Hydro-mechanics and Hydraulics	4	4
Mechanics	6	Hydraulic Laboratory	3	1
Mechanical Engineering	4	Prime Movers	5	3
Biology	18	General Bacteriology	7	4
		Sanitation of Buildings	2	2
Civil Engineering	7	Masonry Construction	2	2
Astronomy	1	General Astronomy	2	2

Ninth Term

Course	No.	Subject	Hrs	Cdts
Civil Engineering	8	Concrete Engineering	3	3
Civil Engineering	9	Structural Laboratory	6	2
Civil Engineering	16	Structural Engineering	10	4
Mechanical Engineering	5	Thermodynamics	4	4
Biology	19	Advanced Bacteriology	7	4
Economics	13	Modern Industries and Industrial Management	2	2
		Inspection Visits and Reports	3	1

Tenth Term

Civil Engineering	11	Arches and Retaining Walls	7	3
Civil Engineering	13	Municipal Engineering	4	2
Civil Engineering	16	Structural Engineering	10	4
		Water Supply and Purification	3	3
Economics	14	Modern Industries and Industrial Management	2	2
		Thesis	4	4
		Inspection Visits and Reports	3	1

Eleventh Term

Civil Engineering	14	Municipal Engineering	4	2
Mechanical Engineering	11	Gas Engines and Producers	5	3
		Water Supply and Purification	3	3
		Sewerage and Sewerage Disposal	3	3
Economics	46	Contracts and Specifications	3	3
		Public Finance	2	2
		Thesis	3	3
		Inspection Visits and Reports	3	1

DEPARTMENTS OF INSTRUCTION

GRAPHICS

1. Mechanical Drawing

Mr. Lambie First Term, 1 credit

The care and use of drafting instruments, instrument exercises, geometrical constructions, lettering, shading, exercises in drawing to scale, and dimensioning.

Three hours per week in drafting room.

2. Mechanical Drawing

Mr. Lambie Second Term, 1 credit

Orthographic projections, rotation of objects, oblique projections, intersections, and development of surfaces.

Three hours per week in drafting room.

Pre-requisite: Graphics 1.

3. Mechanical Drawing

Mr. Lambie Third Term, 2 credits

Isometric drawing and dimensioning, sectioning, and machine drawing.

Six hours per week in drafting room.

Pre-requisite: Graphics, 2.

4. Mechanical Sketching and Drafting

Mr. Lambie Fourth Term, 2 credits

Graded exercises in the measuring and sketching of mechanical constructions, and the subsequent detail drafting of the same.

Six hours per week in drafting room.

Pre-requisite: Graphics, 3.

5. Descriptive Geometry

Mr. Lambie Fifth Term, 4 credits

A critical study of the science of representing by drawing. The location of points, lines, planes, single curved surfaces, surfaces of revolution and warped surfaces, with their relations to each other; tangent lines and planes; intersection of surfaces; shades, shadows, and perspective.

Two lectures and six hours in drafting room per week.

Pre-requisites: Graphics, 4; Mathematics, 7.

6. Applied Descriptive Geometry

Professor Smith 2 credits

The application of descriptive geometry and advanced drawing to engineering problems, including patterns of the developable surfaces, templets in true proportions, and detailed isometric drawings of various parts of the structures. Also, practice in the construction of templets, patterns, etc., with their use.

Six hours drawing per week.

Elective in all engineering courses.

Pre-requisite: Graphics, 5.

MECHANICS

1. Analytic Mechanics

Professor Frost Sixth Term, 5 credits

This subject comprises among its topics the composition and resolution of forces, the center of gravity, the moment of inertia, radius of gyration, laws of friction and of motion, projectiles, impact, machines, work, and energy. The solution of numerous problems in application of formulas is constantly required.

Five recitations and lectures per week.

Pre-requisite: Mathematics, 10.

2. Mechanics of Materials

Professor Smith Seventh Term, 5 credits

The resistance and elasticity of materials. The action of beams under various conditions of fixity and loading; strength of columns and shafts; combined stresses; resilience of materials; etc. Text, Merriman's Mechanics of Materials. Supplemented by lectures.

Five recitations and lectures per week.

Pre-requisite: Mechanics, 1.

3. Mechanical Laboratory

Mr. Richardson Seventh Term, 2 credits

The experimental study of the physical properties of the materials of construction, such as iron and steel, wood, brick, stone, cement, and concrete.

Six laboratory hours per week.

To be taken concurrently with Mechanics, 2.

4. Graphic Statics

Mr. Bankson Seventh Term, 3 credits

The solution of problems in which the stresses in frame work, beams, roof and bridge trusses are ascertained by graphical methods. Methods for dead, snow, wind, and live loads.

One lecture and six hours drawing per week.

Pre-requisites: Graphics, 1; Mechanics, 1.

5. Hydro-Mechanics and Hydraulics

Mr. Richardson Eighth Term, 4 credits

The equilibrium and pressure of liquids; the motion and work of fluids; the flow of water through orifices, over weirs, in pipes, and in canals; measurements of water power; and hydraulic machinery. Text, Lea's Hydraulics.

Four recitations and lectures per week.

Pre-requisites: Mechanics, 1; Mathematics, 10.

6. Hydraulic Laboratory

Mr. Richardson Eighth Term, 1 credit

The experimental study of the flow of water through pipes, nozzles, and orifices, and over weirs. Capacity and efficiency tests of hydraulic turbine pumps and motors.

Three laboratory hours per week.

To be taken concurrently with Mechanics, 5.

PRACTICAL MECHANICS

1. Frame Work and Pattern Making

Mr. Weber and Mr. Heatley First Term, 3 credits

Lectures are given on the use of wood working tools, and the laying out and construction of frame work, templets, patterns and core boxes. The student is required to execute in the University Shops a graded set of exercises in the construction of simple frame work, patterns and core boxes. Inspection trips, on which written reports are required, are taken during shop hours when deemed advantageous.

One lecture and six shop hours per week.

2. Foundry Work

Mr. Weber and Mr. Heatley Second Term, 3 credits

Lectures are given on the principles and practice of moulding and founding of metals. The student is required to execute in the University Shops a graded set of exercises in moulding and core making, together with the melting and casting of metals. Frequent inspection trips, on which written reports are required, are taken during shop hours to local foundries.

3. Forge Work

Mr. Weber and Mr. Thompson Third Term, 3 credits

Lectures are given on the principles and practice of forging and the heat treatment of metals. The student is required to execute in the University Shops a series of exercises in the forging, welding, riveting and case-hardening of soft steel and iron; and the forging and heat treatment of the various grades of tool steel. Inspection trips, on which written reports are required, are taken during shop hours when deemed advantageous.

One lecture and six shop hours per week.

4. Machine Work in Metals

Mr. Weber Fourth Term, 2 credits

Lectures are given on modern machine tools and machine shop practice. The student is required to execute in the University Shops a graded set of exercises in making measurements; and in the use of lathes, planers, shapers, milling machines, grinders, etc.; and in the assembling of machine parts. Frequent inspection trips, on which written reports are required, are taken during shop hours to local machine shops.

One lecture and three shop hours per week.

5. Machine Work in Metals
Mr. Weber Fifth Term, 2 credits

This course is a continuation of Course No. 4.

One lecture and three shop hours per week.

6. Machine Work in Metals
Mr. Weber Sixth Term, 2 credits

This course is a continuation of Courses Nos. 4 and 5.

One lecture and three shop hours per week.

7. Investigation Work 1 credit

The object of this course is to develop initiative and to enable the student to follow up any phase of his course in practical mechanics in which he may be particularly interested; and for which he shall receive one credit when the written report of his investigation has been received and accepted by the professor in charge.

Three shop hours per week.

CIVIL ENGINEERING

1. Surveying
Mr. Bankson Third Term, 3 credits

Lectures, recitations, and field work in the theory, use, and care of surveying instruments. The field work consists of measuring lines and angles; determining areas, running levels, dividing of land, re-location of boundaries, staking out of buildings, etc. Methods of keeping notes are explained, and notes and plots are required of every student.

Two recitations and three hours field work per week.

Pre-requisite: Mathematics, 5.

2. Topography
Mr. Bankson Fourth Term, 3 credits

A course in topographical surveying, including the theory and practice of transit, plane table and stadia methods. Also the applications of railroad, highway, municipal, and hydrographical surveying.

A complete topographic survey is executed. Complete notes and a topographical map are required of every student.

One recitation and six hours field work per week.

Pre-requisite: C. E., 1.

3. TOPOGRAPHY

MR. BANKSON — Fifth Term, 1 credit

A continuation of Course C. E., 2.

Three hours drawing per week.

4. GEODESY

PROFESSOR SMITH — Ninth Term, 4 credits

A study of the precise methods used in geodetic and topographical surveying. The mathematical development of the principles, and the application of the method of least squares, in finding the most probable values, and probable errors, of magnitudes observed in plane and geodetic surveys. Field work, including the measurement of base lines, triangulation and topography.

Three recitations and three hours field work per week.

Pre-requisite: C. E., 3; Mathematics, 10; Astronomy, 1.

5. RAILROAD ENGINEERING, LOCATION

MR. BANKSON — Sixth Term, 4 credits

The reconnoissance, the preliminary survey, and the staking out the center line. The student is required to perform the necessary mathematical calculations incident to the running of simple, compound, and transition curves, overcoming of obstacles, change of location, etc. The line is subsequently leveled, benches and reference points established, topography taken, and the profile made. The student is taught the best methods of keeping the field notes and of checking them, and is given exercises in the solution of problems pertaining to frogs and switches, turnouts and crossings, and the practical application of the same in the field.

Two recitations and six hours of field work per week.

Pre-requisite: C. E., 3.

6. RAILROAD ENGINEERING, CONSTRUCTION

MR. BANKSON — Seventh Term, 2 credits

The student is exercised in the means and methods of cross-sectioning, determination of grades, staking out excavations and embankments, calculating earth work, making estimates on haulage; the classification of earth work, staking out culverts, bridge piers, abutments, and tunnels. Forms and dimensions of tunnels are considered, together with the means and methods of excavation and cost of the work.

One recitation and three hours of calculations and estimates per week.

Pre-requisite: C. E., 5.

7. MASONRY CONSTRUCTION AND FOUNDATIONS

MR. BANKSON Eighth Term, 2 credits

A study of the preparation, strength, and durability of building stones, bricks, common lime mortar, hydraulic cement mortar, and concrete; and the different kinds of masonry construction, such as dams, retaining walls, bridge piers and abutments; also the preparation of ordinary foundations, pile foundations, and foundations under water. Visits of inspection are made, when the opportunity offers, to see work in the process of construction.

Two recitations and lectures per week.

Pre-requisite: Mechanics, 4.

8. CONCRETE ENGINEERING

PROFESSOR SMITH Ninth Term, 3 credits

A study of the mechanics of reinforced concrete, together with applications to the design of typical structures in buildings, bridges, etc. This course should be taken with C. E., 9.

Three lecture hours per week.

Pre-requisites: Mechanics, 2 and 4.

9. ENGINEERING LABORATORY

PROFESSOR SMITH Ninth Term, 2 credits

This course comprises laboratory work generally related to structural engineering in steel and concrete.

Six laboratory hours per week.

Pre-requisites: Mechanics, 2, 3, and 4.

10. ENGINEERING LABORATORY

PROFESSOR SMITH Tenth Term, 2 credits

A continuation of Course C. E., 9.

Six laboratory hours per week.

11. ARCHES AND RETAINING WALLS

MR. BANKSON Tenth Term, 3 credits

Theory of arches; external forces; methods of failure by sliding, rotation, crushing. Methods of testing: stability, criteria of safety. Location of the line of resistance. Symmetrical and unsymmetrical loading. Curvature of linear arches. Rules and formulas derived from practice. Design of retaining walls, including dams and methods of failure. Theoretical and empirical formulas.

One recitation and six hours design per week.

Pre-requisite: C. E., 8.

12. ROADS AND PAVEMENTS

MR. BANKSON — Eleventh Term, 3 credits

A study of the location, width, and transverse section of roads and streets, together with a study of the materials used and methods of constructing or improving the surfaces of roads and pavements.

Two recitations and three hours laboratory per week.

Pre-requisites: Geology, 1; and Mechanics, 3.

13. MUNICIPAL ENGINEERING

MR. LAMBIE — Tenth Term, 2 credits

The subject of water supply is taken up, dealing with the quantity required, the gauging of streams by means of floats, current meters, etc., computations to determine the necessary storage to insure a given supply, the design of standpipes, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of water.

Also the drainage of buildings and lands, the sewerage of cities and towns, the design of a sewerage system for a given district, and the study of the different methods of treatment and disposal of sewage.

One lecture and recitation, with three hours field work and designing per week.

Pre-requisites: Mechanics, 2 and 5.

14. MUNICIPAL ENGINEERING

MR. LAMBIE — Eleventh Term, 2 credits

A continuation of Course C. E., 13.

One lecture and recitation and three hours design work per week.

15. STRESSES IN TRUSSES, AND BRIDGE DESIGN

PROFESSOR SMITH — Eighth Term, 5 credits

Methods of computing stresses in roof and bridge trusses. An account of the development of bridge building and the principles of economic design, followed by a complete design of a roof truss, a plate girder bridge, a pin-connected bridge, and a critical study of other standard types. The varied forms of bridges in this vicinity, as well as the extensive bridge works here, offer exceptional opportunity to the student in this field of engineering activity. Text, Merriman's Stresses, and Merriman & Jacoby's Bridge Design. Supplemented by lectures.

Five recitations and lectures per week.

Pre-requisites: Mechanics, 2 and 4.

16. STRUCTURAL ENGINEERING

PROFESSOR SMITH Ninth Term, 4 credits

An elementary course in structural designing; including properties of rolled shapes of structural steel; structural shop methods; design and detailing of riveted joints, simple truss members, and minor trusses.

One lecture hour and nine hours in drafting room per week.

Pre-requisite: Mechanics, 4.

17. STRUCTURAL ENGINEERING

PROFESSOR SMITH Tenth Term, 4 credits

Structural engineering as applied in general; and detail designs of various steel framed structures, including mill buildings, highway bridges, and plate girder railroad bridges. The work consists of the complete analysis and design of the structures under a given set of specifications, followed by the practice of making complete general and detail drawings, with stress sheets, weight and cost data, and bills of material.

One lecture hour and nine hours in drafting room per week.

Pre-requisites: C. E., 15 and, 16.

18. STRUCTURAL ENGINEERING

PROFESSOR SMITH Eleventh Term, 4 credits

A study of pin-connected bridge trusses of the various types. The work includes the general design and determination of stresses; the detail design and detail drawings of the structure, with stress sheets, weight and cost data.

One lecture hour and nine hours in drafting room per week.

Pre-requisite: C. E., 17.

19. CURRENT ENGINEERING TOPICS

Fifth to Eleventh Terms, inclusive, 1 credit per term

The object of this course is to increase the student's knowledge of engineering practice as well as to train him in the presentation and discussion of themes in general. Instructors and students of all classes meet on equal terms.

The work consists of original papers, reviews, and general discussions on subjects pertaining to science and engineering.

One session hour per week.

Open to all students.

20. INSPECTION VISITS AND REPORTS

PROFESSOR SMITH Ninth, Tenth, and Eleventh Terms, 1 credit per term

One afternoon in each alternate week is spent in the large industrial plants or at the site of one of the notable engineering structures of the Pittsburgh district. A separate report dealing with the technical details of the inspection is required for each visit.

Pre-requisites: C. E., 6 and 15.

21. THESIS

PROFESSOR SMITH Tenth and Eleventh Terms, 6 credits

For the degree of B. S., in Civil Engineering, a thesis involving a large amount of original work in engineering must be presented in acceptable form and approved by the head of the department several days in advance of the date of graduation. The subject must be decided upon at a time not later than the ninth term of the student's course.

MECHANICAL ENGINEERING

1. KINEMATICS

MR. RICHARDSON Seventh Term, 3 credits

A study of the principles underlying the action of machine elements; the communication of motion by trains of gearing, pulleys, and belts; cams and link work; the different forms of gear teeth; automatic feed motions; quick return motions, etc.

Two recitations and three drawing hours per week.

Pre-requisites: Graphics, 5; Mathematics, 10.

2. MACHINE DESIGN AND DRAWING

MR. RICHARDSON Eighth Term, 4 credits

The proportioning of machine elements, such as shafting, pulleys, cranks, gears, cylinders, and frames. The knowledge thus gained is applied in the complete design of machines to fulfil certain requirements.

Two recitations and lectures and six drawing hours per week.

Pre-requisites: Graphics, 5; Mechanics, 2; M. E., 1.

3. MACHINE DESIGN AND DRAWING

MR. RICHARDSON Ninth Term, 3 credits

Continuation of Course M. E., 2.

One recitation and lecture and six drawing hours per week.

4. PRIME MOVERS

MR. RICHARDSON Eighth Term, 3 credits

A brief study of the construction and operation of steam boilers, engines and turbines; and of gas engines and producers.

Two lectures and three laboratory hours per week.

Pre-requisites: Mechanics, 1; Physics, 13.

5. Thermodynamics

Professor Stewart Ninth Term, 4 credits

A study of the general principles of energetics, the cycle, the thermal properties of matter, the steam engine cycle, the laws of gases, gas engine cycles, refrigerating machine cycles, and the thermal modifications of the theoretical cycle in actual steam and gas engines. The object of this course is to prepare the student for courses in steam engine design, gas engines, compressed air and refrigerating machinery.

Four lectures and recitations per week.

Pre-requisites: Mathematics, 10; Physics, 15.

6. Compressed Air Machinery

Professor Stewart Tenth Term, 2 credits

A study of the physical properties of air, its isothermal and adiabatic compression and expansion, single and multiple-stage air compression, and the principal types of air compressors. Visits are made for the purpose of enabling the student to see the practical working of compressed air machinery.

Two lectures per week.

Pre-requisites: M. E., 3 and 5.

7. Refrigeration

Professor Stewart Tenth Term, 1 credit

Refrigeration and Ice-making machinery.

One lecture per week.

Pre-requisites: M. E., 3 and 5.

8. Steam Boilers

Professor Stewart Tenth Term, 3 credits

A study of the principal types of steam boilers, the design of the different structural details, the proportioning of a boiler of given type and horse-power, and the design of boiler accessories. Lectures on shop practice in boiler construction and visits of inspection to boiler and other plate metal shops. A study of fuels and furnaces used in the generation of steam, and of coal and ash handling machinery.

Two lectures and three drawing hours per week.

Pre-requisites: Physics, 15; Chemistry, 8; M. E., 3 and 5.

9. Steam Engines

Mr. Richardson Tenth Term, 3 credits

A study of indicator cards, entrophy-temperature and crank effort diagrams for the best known types of simple and compound engines; also the design of engine details, such as crank shafts, crank pins, connecting rods, pistons, valve gears, governors, and fly-wheels. Lectures are given on shop practice in engine construction, and visits of inspection are made to study engines in process of construction and to steam power plants to study them while in operation.

One lecture and six drawing hours per week.
Pre-requisites: M. E., 3 and 5.

10. Steam Turbines

Mr. Richardson — Eleventh Term, 3 credits

A study of the theory of steam turbines and of the constructive details of the types most commonly in use for the generation of power. Visits of inspection are made to local plants to study turbines in the process of construction and in operation.

Three lectures and recitations per week.
Pre-requisites: M. E., 3 and 5.

11. Gas Engines and Producers

Professor Stewart — Eleventh Term, 3 credits

A study of modern gas engines and of the production of gas for motive power. A study is made of typical gas engine details, after which the principal computations and drawings are made for a gas engine of given type and horse-power. Visits are made to see gas engines under process of construction and to see them operating.

Two recitations and lectures and three drawing hours per week.
Pre-requisites: Physics, 15; Chemistry, 8; M. E., 3 and 5.

12. Power Plant Engineering

Professor Stewart — Eleventh Term, 3 credits

A study of the selection and proportioning of the essential details of a power plant. Lectures are given on location of plant, type of power house, foundations for engines and chimneys, and visits of inspection are made to a number of representative power plants to enable the student to study their practical operation, and, when opportunity affords, visits are made to see power plants in process of construction.

Two lectures and three drawing hours per week.
Pre-requisites: M. E., 8, 9, 10, and 11; E. E., 5.

13. Steam Laboratory

Mr. Richardson — Tenth Term, 2 credits

The testing and calibration of pressure and vacuum gauges, steam engine indicators, planimeters, etc.; indicator and dynamometer power measurements, valve setting, and determination of mechanical efficiency of engines; test of auxiliary apparatus, etc.

Six laboratory hours per week.

Pre-requisites: Physics, 15; M. E., 4 and 5.

Taken concurrently with M. E., 8 and 9.

14. Power Plant Testing

Mr. Richardson Eleventh Term, 1 credit

Capacity and efficiency tests of steam and gas engine power plants, together with complete reports on same. These tests as far as practicable will be conducted upon recently constructed power plants. The time allotted to this course, while somewhat variable, will approximate the equivalent of three laboratory hours per week.

Pre-requisites: Physics, 15; Chemistry, 8; M. E., 4, 5, 8, and 9; Taken concurrently with M. E., 10, 11, and 12.

15. Manufacture and Properties of Iron and Steel

Professor Stewart Eleventh Term, 3 credits

A study of (1) the Bessemer process, the theory and construction of gas producers, the open hearth or Siemens process, and the production of steel castings; (2) the mechanical treatment of steel including a study of the five leading types of rolling mills, and the three processes for the manufacture of steel tubes; (3) the heat treatment of steel. Visits of inspection, on which reports are required, are made to a number of the great steel and tube mills in the vicinity of Pittsburgh.

Two lectures and either three laboratory hours or one afternoon inspection trip per week.

Pre-requisites: Chemistry, 8; Physics, 15; M. E., 4; E. E., 5 and 18.

16. Inspection Visits and Reports

Professor Stewart Ninth, Tenth, and Eleventh Terms, 1 credit each

Visits of inspection are made to shops, mills, factories, and power plants.

The University being located as it is in a vast field of industrial activity, probably the most extensive of its kind in the world, affords the student a rare opportunity for studying practical engineering in all its varied forms. After each visit the class meets with the instructor in charge to discuss what was seen. The student then prepares and submits a report, which not only provides him with a record of useful data, but also, gives him an excellent exercise in technical composition.

The equivalent of one afternoon each alternate week.

17. CURRENT ENGINEERING LITERATURE

PROFESSOR STEWART AND MR. RICHARDSON

Ninth, Tenth, and Eleventh Terms, 1 credit each

This course consists of written reviews and discussions of the current engineering literature pertaining to engineering practice.

One hour session each alternate week, together with outside readings and written reviews.

18. THESIS Tenth and Eleventh Terms, 3 credits each

The subject must be chosen and presented to the head of the department for approval during the latter part of the ninth term.

This work will generally consist of the following: (1) The preparation of a bibliography of the important literature on the subject chosen; (2) the student's own investigations and deductions; and (3) the preparation of the thesis proper.

The thesis must be delivered in its final bound form to the head of the department not later than one week before date of commencement.

ELECTRICAL ENGINEERING

1. DYNAMO ELECTRIC MACHINERY

MR. HARRIS Seventh Term, 5 credits

A study of the fundamental principles of electricity and magnetism and their application to direct current machinery.

Five lectures and recitations per week.

Pre-requisite: Physics, 13.

2. APPLIED ELECTRICITY

MR. HARRIS Seventh Term, 3 credits

This is a short course designed to meet the requirements of those not specializing in Electrical Engineering.

Two lectures and recitations and three hours laboratory per week.

Pre-requisite: Physics, 13.

3. APPLIED ELECTRICITY

MR. HARRIS Seventh Term, 3 credits

This course is similar to E. E., 2; but more comprehensive in scope. Designed with special reference to the needs of Mechanical Engineering students.

Two lectures and recitations and three hours laboratory per week.

Pre-requisite: Physics, 13.

4. Applied Electricity

Mr. Harris — Eighth Term, 3 credits

A continuation of Course E. E., 3.

Two lectures and recitations and three hours laboratory per week.

5. Applied Electricity

Mr. Harris — Ninth Term, 3 credits

A continuation of Course E. E., 4.

Two lectures and recitations and three hours laboratory per week.

6. Alternating Current Theory

Mr. Harris — Eighth Term, 3 credits

This course consists of a mathematical and graphical treatment of periodic functions as exemplified in alternating currents with the attendant phenomena of inductance, capacity, etc.. singly and in combinations.

Three lectures and recitations per week.

Pre-requisites: E. E., 1; and Mathematics, 11.

7. Alternating Current Machinery

Ninth Term. 3 credits

A mathematical and graphical treatment of alternating current phenomena as applied to electrical machinery. A study is made of the different types of generators, motors, synchronous converters, etc.

Three lectures and recitations per week.

Pre-requisite: E. E., 6.

8. Alternating Current Machinery

Tenth Term, 3 credits

A continuation of Course E. E., 7.

Three lectures and recitations per week.

9. Alternating Current Machinery

Eleventh Term, 3 credits

A continuation of Course E. E., 8.

Three lectures and recitations per week.

10. General Electrical Engineering

Professor Kintner — Ninth Term, 3 credits

This course is designed to cover the engineering and economic phases of the more special branches of Electrical Engineering, such as electric traction, electric transmission of power, etc.

Three lectures and recitations per week.

Pre-requisite: E. E., 6.

11. General Electrical Engineering

Professor Kintner Tenth Term, 3 credits

A continuation of Course E. E., 10.

Three lectures and recitations per week.

12. General Electrical Engineering

Professor Kintner Eleventh Term, 3 credits

A continuation of Course E. E., 11.

Three lectures and recitations per week.

13. Electrical Engineering Design

Professor Kintner Ninth Term, 4 credits

This course is intended to give the student practice in the application of the fundamental theory of electricity and magnetism to the calculation and proportioning of electrical machinery. A portion of the time is devoted to the study of the materials entering into electrical construction.

Two lectures and six hours in design room per week.

Pre-requisite: E. E., 1.

14. Electrical Engineering Design

Professor Kintner Tenth Term, 4 credits

A continuation of Course E. E., 13.

Two lectures and six hours in design room per week.

15. Electrical Engineering Laroratory

Mr. Harris Seventh Term, 1 credit

This course is designed to furnish an experimental basis for the theory given in Course E. E., 1. It consists largely of elementary direct current machine tests.

Three hours laboratory per week.

Pre-requisite: Registration in Course E. E., 1.

16. Electrical Engineering Laboratory

Mr. Harris Eighth Term, 1 credit

An experimental study of alternating current circuits, supplementing Course E. E., 6; with special reference to the effect of inductance and capacity, singly or in combinations. The measurement of alternating current single and polyphase power and the determination and analysis of wave forms constitutes a portion of the work.

Three hours laboratory per week.

Pre-requisite: Registration in Course E. E., 6.

17. ELECTRICAL ENGINEERING LABORATORY

Ninth Term, 2 credits

Advanced direct and alternating current testing of generators, motors, transformers, converters, rectifiers, etc., both commercial and for the purpose of investigation.

Six hours laboratory per week.

Pre-requisite: Registration in Course E. E., 7.

18. ELECTRICAL ENGINEERING LABORATORY

Tenth Term, 2 credits

A continuation of Course E. E., 17.

Six hours laboratory per week.

19. ELECTRICAL ENGINEERING LABORATORY

Eleventh Term, 2 credits

A continuation of Course E. E., 18.

Six hours laboratory per week.

20. ELECTRICAL ENGINEERING SEMINAR

Ninth, Tenth, and Eleventh Terms, 1 credit per term

The student and instructors meet regularly to discuss current engineering topics of interest. A portion of the time is devoted to reviews and to reports and discussions of thesis matter by the seniors.

One hour per week.

Open to all students in Electrical Engineering.

21. INSPECTION VISITS AND REPORTS

MR. HARRIS Ninth, Tenth, and Eleventh Terms

Frequent visits of inspection are made to the numerous manufacturing establishments, both electrical and mechanical, in this vicinity. The University is unusually fortunate in being located in this great manufacturing center, where the student sees the principles which he studies in the department daily put into practical operation. Among the many large electrical establishments accessible to the technical students, especial benefit is derived from the great Westinghouse works, to which the classes are welcomed visitors at any time.

These visits of inspection are required of all seniors in the Electrical Engineering Department.

22. ELECTRICAL ENGINEERING THESIS

5 credits

A thesis is required of all candidates for the degree of B. S., in Electrical Engineering. This will consist of a report on original investigations and is intended to demonstrate the student's ability to think and act along independent lines. The subject must be approved by the professor in charge by January 15th prior to commencement and an outline of the results desired and method to be employed approved not later than April 1st.

23. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM
Tenth Term, 3 credits

A rigid Mathematical treatment of electricity and magnetism, including a study of Hertz's experiments and the present day theory of electro-magnetism.

Three lectures and recitations per week.

Pre-requisite: Mathematics, 11.

24. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM
Eleventh Term, 3 credits

A continuation of Course E. E., 23.

Three lectures and recitations per week.

MATHEMATICS

2. ADVANCED ALGEBRA
PROFESSOR FROST First Term, 5 credits

A course for students who have passed maximum entrance examinations, beginning at logarithms and completing the subject.

Required in all engineering courses.

5. PLANE TRIGONOMETRY Second Term, 3 credits

The subjects treated are the functions of angles, goniometry. trigonometric equations, solution of right and oblique triangles. Emphasis is placed upon solution of examples of all kinds, involving the theory and its practical applications. Text-Book, Wentworth's.

Required in all engineering courses.

7, 8. ANALYTICAL GEOMETRY Second Term, 2 credits
PROFESSOR FROST Third Term, 3 credits

A study of the equations and loci of right lines, conic sections and curves of higher degree; transformation of co-ordinates; analysis of the general equations of the second degree. Text-Book, Nichol's Analytic Geometry.

Required in all engineering courses.

9, 10. CALCULUS
PROFESSOR FROST Fourth and Fifth Terms, 4 credits each term

The formulas for differentation are deduced both by the method of rates and that of limits and the usual practical applications are made. Integration of elementary forms is taught early in the course, and applications are made to the solution of numerous problems involving the quadrature of plane surfaces and volumes of revolution, etc. The aim throughout the course is to give the student such working knowledge of the methods of calculus that he may apply them with confidence and facility. Text, Nichol's Differential and Integral Calculus.

Required in all engineering courses.

11. Differential Equations Seventh Term, 2 credits

Ordinary differential equations. A short course, required in Electrical Engineering.

PHYSICS

11, 12, 13. General Physics

Professor Bishop and Assistant

Fourth, Fifth and Sixth Terms, 5 credits, each term.

It is the purpose of this course to familiarize the student with the fundamental principles of the science. The historical development of the subject, its relation to other sciences, and its practical applications to daily life are emphasized.

The calculus is extensively employed and special attention is given to the physical interpretation of mathematical equations.

A series of twelve lectures on the precision of measurements is given in connection with the laboratory work. Special attention is given in the laboratory to the method of the experiment and to the precision of the results.

Concurrent with Mathematics 9 and 10.

Required of all Engineering students.

14, 15, 16. Advanced Physical Laboratory

Mr. Harris Seventh and Eighth Terms, 3 credits each term

This course deals primarily with electrical measurements, but includes experiments in measurement of high temperature, calorific power of fuels, and photometry. The experiments for each student are assigned according to the course he is pursuing.

Pre-requisite, Physics 11, 12, 13.

CHEMISTRY

1, 2. General Inorganic Chemistry

Dr. Vogt and Mr. ——— First and Second Terms, 4 credits each term

Two lectures or recitations and six laboratory hours a week. This course includes lectures and recitations upon the chemistry of the non-metals and metals. It forms an introduction to the study of chemistry and serves as a foundation for the various courses in this department.

The laboratory work includes experiments in further illustration of the subject.

Required in all engineering courses.

8. QUALITATIVE ANALYSIS

ASSISTANT PROFESSOR SILVERMAN AND MR. ———

Third Term, 4 credits

This course consists of two lectures or recitations and six laboratory hours a week. The work includes the study of the reactions of bases and acids and the analysis of simple compounds and mixtures.

Pre-requisites, Courses 1, 2.

Required in all engineering courses.

9, 10, 11. QUANTITATIVE ANALYSIS

ASSISTANT PROFESSOR SILVERMAN

Fourth, Fifth and Sixth Terms, 3 credits each term

This course consists of one lecture and six laboratory hours weekly, and includes a general study of the simpler methods of the determination of the commonly occurring elements and radicals, and also the complete analysis of various minerals.

Pre-requisite, Course 8.

Required in Chemical and Sanitary Engineering courses.

12. QUALITATIVE ANALYSIS

ASSISTANT PROFESSOR SILVERMAN Seventh Term, 3 credits

For the completion of this course, one lecture and six laboratory hours a week are required. The work includes complete analysis of minerals, ores, iron, and steel, cements and alloys.

Pre-requisite, Courses 9, 10, 11.

Required in Chemical Engineering.

15, 16. ORGANIC CHEMISTRY

PROFESSOR PHILLIPS Seventh and Eighth Terms, 4 credits each term

This course consists of two lectures or recitations and six hours of laboratory throughout the year. The subject is taught in an elementary way, and deals with the constitution, preparation and properties of the typical compounds of the fatty and benzene series. The laboratory work includes practice in synthetical methods. Text-Book, Remsen's Organic Chemistry.

Required in Chemical Engineering.

22. PHYSICAL CHEMISTRY

DR. VOGT Eleventh Term, 2 credits

A general course in the theories of chemistry.

Required in Chemical Engineering.

27, 28, 29. TECHNICAL CHEMISTRY

PROFESSOR PHILLIPS Ninth, Tenth, and Eleventh Terms, 3 credits each term

Lectures upon the chemistry of manufacturing operations, having reference especially to chemical industries in the Pittsburgh region. Visits are made to the various chemical works in the vicinity, attendance upon which is required.

Required in Chemical Engineering.

34. WATER EXAMINATION

PROFESSOR PHILLIPS Seventh Term, 3 credits

Lectures and laboratory work in the examination of water with reference to its suitability for domestic use. One lecture and six hours of laboratory weekly.

Pre-requisite, Course 9-11.

Required in Sanitary Engineering.

BIOLOGY

3. GENERAL BIOLOGY. BRIEFER COURSE

PROFESSOR FETTERMANN AND ASSISTANTS Fifth Term, 3 credits

This course is designed to meet the needs of engineering students. During the first half of the course attention is given to the study of animal forms, including classification, distribution, habits, etc. The remainder of the term is given to the study of the morphology, classification and distribution of plants.

One lecture and four laboratory hours each week.

17, 18. BACTERIOLOGY

PROFESSOR FETTERMANN Seventh and Eighth Terms, 4 credits each term

This course is intended for students taking regular courses in Biology, and also those who may elect the work in Sanitary Engineering. Students are expected to become familiar with the methods of detection, isolation, and identification of various micro-organisms. Lectures are given on the classification, morphology, structure, reproduction and cultural characteristics of bacteria. Instruction is given on the principles of sterilization and disinfection special emphasis being laid upon their practical application. In the latter part of the course special attention is given to the study of the bacteria occurring in soil, water and milk. The manner in which bacteria produce disease and the production of immunity are explained. Text-books: Jordan; Abbott; Muir and Ritchie.

One lecture and six hours laboratory each week.

19. ADVANCED BACTERIOLOGY

PROFESSOR FETTERMANN Ninth Term, 4 credits

One lecture and six hours laboratory each week.

This course is the continuation of Course 18. The object is to impart a practical knowledge of the bacteriology of water, milk and sewage. Bacteria are studied in their relation to the dairy industry, and water supply, and also with reference to the part they play in the purification of sewage.

ENGLISH LANGUAGE AND LITERATURE

1, 2, 3. RHETORIC AND COMPOSITION

MR. ——— First, Second and Third Terms, each 3 credits

A study of the principles of composition, with exercises in the analysis of prose selections, practice in writing, and criticism.

Required of Freshmen.

4, 5, 6. RHETORIC AND COMPOSITION

MR. ——— First, Second and Third Term, each 2 credits

A course in rhetorical practice and theory, aiming to develop effectiveness in writing. Study and analysis of prose masterpieces, with especial reference to structure. Frequent practical exercises, and individual criticism in conference.

Required of all Freshmen who present four preparatory units in English. Elective for others who have taken Courses 1, 2, 3.

7. ARGUMENTATION AND DEBATING

PROFESSOR GIBBS AND MR. ——— Fourth Term, 3 credits

The theory of argumentation, with practical exercises in brief-drawing and the composition and delivery of forensics.

Elective for students who have taken Courses 1, 2, 3, or 4, 5, 6. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15.)

15. ENGLISH LITERATURE

PROFESSOR GIBBS Fourth Term, 3 credits.

A study of selected masterpieces representing the successive periods of English literature, with a text-book to furnish a historical background and connections.

Required of Sophomores. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15. For their benefit both courses will be offered in the Fall and Summer terms.)

1, 2. Public Speaking

Mr. ——— First and Second Terms, 2 credits

Exercises in the fundamentals of public address. Individual instruction in small classes.

Required in all Engineering Courses.

3. ROMANCE LANGUAGES AND LITERATURES

Professor Harry

1, 2, 3. Elementary French

First, Second and Third Terms, 3 credits each term

Grammar, composition, and easy reading, with thorough drill in pronunciation and practice in speaking.

Open to Freshmen who have satisfied requirements for admission by offering German or Latin, if they wish to pursue French as the required modern language.

Required by all Engineering students.

4, 5, 6. Intermediate French

Fourth, Fifth and Sixth Terms, 3 credits each term

Extensive reading in selected works of Modern French writers. Fraser and Squair's Grammar completed. Advanced prose composition. French conversation. The following texts are read: Daudet, Contes Choisis; Maupassant, Contes; Coppee, On Rend l'Argent; Augier, Le Gendre de M. Poirier; George Sand, La Mare au Diable; Canfield, French Lyrics.

Required by all Freshmen satisfying entrance requirements in French who elect to continue it.

4. GERMAN LANGUAGE AND LITERATURE

Professor Berger

1, 2, 3. Elementary German

First, Second and Third Terms, 3 credits each term

Elements of grammar and the reading of easy texts. Vos, Essentials of German; Hewitt's German Reader; Simple Lyrics and ballads memorized. Gerstaecker, Germelhausen; Bambauch, Der Schwiegersohn.

Open to Freshmen who have satisfied requirements for admission by offering French or Latin if they wish to take up German as the required modern language.

4, 5, 6. Intermediate German

Fourth, Fifth and Sixth Terms, 3 credits each term

Review of Grammar. Drill in translating from English into German, and practice in conversation. Memorizing of simple prose and poetry. Wesselhoeft, German Exercises. Wenckebach, German Composition. Wildeburch, Des edle Blut. Gerstaecker, Irrfahrten. Hatfield, German Lyrics and Ballads.

Classical German Authors. Selections from the following list of texts: Schiller, Maria Stuart. Goethe, Hermann und Dorothea. Lessing, Minna von Barnhelm. German is used extensively in conducting class work.

Required by all Freshmen satisfying entrance requirements in German who elect to continue it.

PHYSICAL EDUCATION

Dr. Wallgren

Physical training and development is obligatory upon all members of the Freshman and Sophomore classes, subject to such exceptions only in particular cases, as may be determined by the committee in charge. All undergraduate candidates for a degree must, in addition to the scholastic requirements for the degree, take for two years three actual hours a week of physical training. This work should be completed two years prior to his graduation in the classes specified, but may be postponed to a time later in the course, if sufficient reason exists for so doing.

Accepted candidates for the various athletic teams will receive credit for the amount and degree of work accomplished.

1. Physical Exercises. Exercises consisting of work indoors and out, students entering the University, and, at the beginning of each athletic season, for all men who are to train for athletic competitions in class or University contests.

Appointments for these examinations are made at the Gymnasium office.

Special medical advice or re-examination of students daily 12 to 1 M. at Gymnasium office.

1. Physical Exercises. Exercises consist of work indoors and out, prescribed for individual defect or immaturity, or of work prescribed in one of the various branches of athletics under the supervision of the Department.

2. Advanced Gymnastics. Open to those, already proficient in apparatus work, who desire to specialize.

3. Leaders' Class. Selected from students who have had previous training, who will be excused from regular work for rendering assistance.

4. Boxing.
5. Wrestling.
6. Fencing.
7. Hygiene.

7 FEBRUARY 1, 1911 No. 3

University of Pittsburgh

BULLETIN

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OF THE
UNIVERSITY OF ILLINOIS

ANNOUNCEMENT OF THE
SCHOOL OF ENGINEERING
FOR
1911-1912

AND

ALUMNI REGISTER
OF THE
SCHOOL OF ENGINEERING

1908

Entered June 4, 1910 at the Post Office at Pittsburgh, Pa., as second class matter under act of Congress of July 16, 1894.

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SCHOOL OF ENGINEERING.

CALENDAR

1911	
September 21-23	Thursday to Saturday—Entrance Examinations and Registration.
September 25	Monday—Fall Term begins.
Nov. 30-Dec. 2	Thanksgiving recess, Thursday to Saturday.
December 16	Saturday—Fall Term ends.
Term Vacation from Monday, December 18, to Tuesday, January 1, 1912.	
1912	
January 2	Tuesday—Winter Term begins.
February 8	Thursday—Day of Prayer for Colleges.
February 22	Thursday—Washington's Birthday, holiday.
March 23	Saturday—Winter Term ends.
March 25	Monday—Spring vacation of one week begins.
April 1	Monday—Spring Term begins.
April 5	Good Friday, holiday.
June 9	Sunday—Baccalaureate Sermon.
June 12	Wednesday—Commencement.
June 13-15.	Thursday to Saturday—Entrance Examinations and Registration.

OFFICES AND OFFICE HOURS

Office, Thaw Building, Grant Boulevard—Consultation Hours: 8:30 A. M. to 5:30 P. M.

General Office, School of Mines Building; Telephone Schenley 2500.

For catalogs and other information, address the Secretary of the University, Grant Boulevard.

MEMBERS OF FACULTY AND TEACHING STAFF

Samuel Black McCormick, D.D., LL.D., Chancellor.

Frederic Lendall Bishop, Ph.D., Dean, Professor of Physics.

Daniel Carhart, M.C.E., Sc.D., Emeritus Professor of Civil Engineering.

Francis Clifford Phillips, Ph.D., Professor of Chemistry.

Albert Ellis Frost, A.M., Sc.D., Professor of Mathematics.

Reid Thomas Stewart, Ph.M., C.E., Professor, and Head of Department, of Mechanical Engineering.

John Hammond Smith, E.E., Professor, and Head of Department, of Civil Engineering.

Samuel Montgomery Kintner, B.M.E., Professor, and Head of Department, of Electrical Engineering.

Robert Kennedy Duncan, A.B., Professor of Industrial Chemistry and Head of Department of Chemical Engineering.

Morris Knowles, B.S., C.E., Director, Department of Sanitary Engineering.

David Francis Crawford, Director, Department of Mechanical Railway Engineering.

Leslie Huntington Harris, B.S. in E.E., Assistant Professor of Electrical Engineering.

Iden Foster Richardson, B.S. in M.E., Instructor in Mechanical Engineering.

Ellis Edward Bankson, B.S. in C.E., Instructor in Civil Engineering.

Joseph Sioussa Lambie, C.E., Instructor in Graphics.

John Weber, M.E., Instructor in Practical Mechanics.

Frank Thurman Leilich, E.E., M.S., Instructor in Electrical Engineering.

Charles Thompson, Assistant in Practical Mechanics.

Wliliam James Heatley, Assistant in Practical Mechanics.

S. B. Linhart, A.M., D.D., Secretary of the University.

MEMBERS OF FACULTY AND TEACHING STAFF OF OTHER SCHOOLS GIVING INSTRUCTION IN THE SCHOOL OF ENGINEERING.

Marshman Edward Wadsworth, Ph.D., Professor of Mining Geology.

John Colvin Fettermann, Ph.M., Professor of Biology.

Ferdinand Berger, A.M., Professor of German.

Jesse Hayes White, Ph.D., Professor of Psychology.

John Thom Holdsworth, Ph.D., Professor of Finance and Economics.

Lincoln Robinson Gibbs, A.M., Professor of English.

Alexander Silverman, A.B., M.S., Assistant Professor of Chemistry.

Phillip Warner Harry, Ph.D., Assistant Professor of Romance Languages.

Clarence Charles Vogt, A.M., Ph.D., Assistant Professor of Inorganic and Physical Chemistry.

Calvin Naftzinger Wenrich, A.M., Ph.D., Instructor in Physics.

Frank Craig Jordan, A.M., Assistant Professor of Astronomy.

Arthur Edward Fish, A.B., Instructor in Public Speaking.

Ira Graessle Flocken, A.M., Instructor in Industry and Accounting.

Salvatore Musso, Instructor in Italian.

Hurd Thompson Morris, B.S., Fellow in Physics.

Vincent Holland Ogburn, Ph.B., Fellow in English.

William Henry Ehmsen, Mechanician, Departments of Physics, and Electrical Engineering.

Joseph Wallace, Operating Engineer in Mechanical Laboratory.

CO-OPERATIVE PLAN OF ENGINEERING INSTRUCTION

The work in the School of Engineering is carried on under the co-operative plan. This means that the student, during his course, works four terms of three months each in some of the engineering industries of the Pittsburgh district, and receives the same amount of theoretical training as he would in any engineering school, in addition.

The work is conducted under actual commercial conditions. Thoroughly practical knowledge can be had only by actual work in the engineering industries and should be required as early as possible. Working side by side with other employees, students get an insight into labor conditions. Detailed observation of engineering work and the conduct of business, from the productive point of view, gained in the students formative years, is an invaluable addition to knowledge gained from text-books and instructors.

Although the University has made special arrangements with local industrial concerns and will co-operate with these concerns, in all possible ways, for the benefit of its engineering students, students are regarded as direct employees of the concerns. They serve for six working days each week, receive the pay of student apprentices, are required to observe the regulations of the company, and are subject to existing labor conditions and laws, including those pertaining to liabilty for accidents.

This industrial practice is arranged, so far as feasible, to provide every student with an opportunity of working in the branch of engineering in which he is especially interested. It is also arranged that a part of the students shall be in school and a part in practical work at the same time, interchanging in such a manner that continuous service is furnished to the manufacturer.

Each student reports to the proper instructor one evening of each alternate week, for discussion of his practical work; at the end of the term, on presentation of a written report of his work and observations, he receives twenty credits.

VISITS OF INSPECTION

To take advantage of the opportunities offered by the Pittsburgh district in every way possible, there has been organized a series of visits of inspection to the different manufacturing plants. These begin in the Freshman year when the visits are made in connection with Chemistry and Shop-work, and extend throughout the entire course. During the Junior and Senior years, they are made in connection with the special work of the different departments.

All visits of inspection are preceded by a half-hour descriptive lecture by the instructor. Reports are required from each student on each visit. The following is a partial list of the plants and engineering work visited during the year 1910-1911:

Phipps Power Plant,
Westinghouse Machine Company,
National Tube Company,
Power Plant, Pittsburgh Railways Company,
Riter-Conley Manufacturing Company,
Jones & Laughlin Steel Company,
Pressed-Steel Car Company,
Pittsburgh & Lake Erie Repair Shop,
Pittsburgh Water-Filtration Plant,
Fort Pitt Bridge Works,
Beaver Bridge,
Sewickley Bridge,
Electrically-operated Coal Mines,
Buffalo and Niagara Falls,
Renshaw Plant of Butler Line,
Mesta Machine Company,
Westinghouse Electric & Manufacturing Company,

Shelby Steel-Tube Company,
United Engineering & Foundry Company,
American Bridge Company,
Carnegie Steel Company, Homestead Works,
Universal Portland Cement Company,
United States Government Testing Laboratories,
McClintic-Marshall Construction Company,
Union Switch & Signal Company,
Brunot's Island Power-Plant,
Rankin Plant of Allegheny County Light Company.

EQUIPMENT

The buildings of the University are new and embody the latest ide of design in class-rooms, drafting-rooms, laboratories, etc. Four larg and well equipped rooms are provided for drafting and design wor The laboratories are all newly equipped and the latest types of equi ment are constantly being added.

Field-Instrument Equipment

This equipment, which has recently been largely augmented, includ a large assortment of the various types and makes of instruments us in land surveying, railroad surveying, construction work, leveling, a geodetic surveying. The instruction of the student in the care, adjus ment, and use of the various types of instruments has been kept clearly mind and well provided for in the selection of equipment. The Alleghe Observatory, which is the Astronomical Department of the Universit affords exceptional advantages for students who desire to specialize geodetic or astronomical work.

Materials Testing Laboratory

This laboratory is equipped with machines and instruments for t measurement of the physical properties of the materials of constructio and for tests on manufactured specimens.

There are three universal testing machines, ranging from 50,000 lb to 200,000 lbs. capacity, for tension, compression, and flexure tests. T 200,000 lbs.-capacity machine is capable of taking 15 foot columns, tensi specimens accordingly, and flexure specimens up to 20 ft. lengths.

The laboratory also contains a 230,000 inch pound torsion machin with a three-inch chucking capacity, and for lengths up to 16 feet; hand-power flexure machine of 5,000 lbs capacity; two automatic briquett testing machines, standard molds, scales, sieves, moist closet and oth similar apparatus necessary for the examination of cements, cement mortars, and concrete.

In addition to the above mentioned machines and apparatus, there will be provided a punch and shear machine, together with pneumatic tools for doing experimental fabrication work.

Hydraulic Laboratory

For hydraulic experiments there are a Worthington two-stage turbine pump driven by variable-speed motor, a Pelton wheel, and receiving and measuring tanks with weir discharge. There are also water-meters, orifices, nozzles, and a Venturi meter for determining the flow of liquids.

Steam and Power Laboratory

There is provided the usual equipment for measuring the pressure, temperature, and flow of steam, such as gauges, thermometers, calorimeters, condensers, and indicators, together with suitable apparatus for standardizing and calibrating these.

A Babcock & Wilcox 100 H. P., 200 lb.-pressure boiler, with a superheating chamber, is used in experimental and power-plant work.

The equipment includes a composite cross-compound steam engine, 7½ and 18 by 14 inches, arranged to run condensing or noncondensing; high-pressure cylinder controlled by single valve; low-pressure cylinder controlled by four Corliss-type valves. The engine is provided with friction brake, which serves for applying loads and for measuring the power delivered at the wheel; and is arranged so that either side may be operated as a simple engine, condensing or non-condensing.

A two-cylinder Westinghouse gas engine, provided with all necessary apparatus for making gas-engine tests is used for experimental purposes. In addition to this there are two three-cylinder Westinghouse gas engines for power purposes located in the laboratory.

A motor-driven air-compressor furnishes air for laboratory purposes, and is arranged for use in experimental work.

Dynamo Laboratory

The dynamo-room of the electrical laboratory contains the usual equipment of direct-current and alternating-current motors and generators, and transformers, of different makes and capacity. This includes direct current generators, constant and variable-speed direct-current motors, single-phase and polyphase induction motors, single-phase series motors, two-phase and three-phase synchronous converters, a. c.-d. c. motor-generator set, and a General Electric mercury-arc rectifier. In addition to the above there is available for special work, the two 37.5 k. w. direct-connected gas-engine-driven generators, and the large motor-generator set consisting of a 150 h. p., two-phase induction motor, direct-connected to a 100 k. w., 220 volt, three-wire generator, belonging to the University power plant. The laboratory is well equipped with accessory apparatus, such as measuring instruments, brakes, load and starting rheostats, dynamometers, induction regulators, etc. A large floor crane facilitates the rapid and convenient arrangement of apparatus for the different tests, while a well appointed three-panel switch-board distributes power of the desired kind and voltage to any part of the laboratory.

Electrical Standardizing Laboratory

One room is set apart for accurate work in standardizing the apparatus used in the electrical tests. This room is supplied with power by means of special circuits and a special distributing panel, and is equipped with standards of resistance, inductance, and capacity. A Weston laboratory standard voltmeter and a certified Wolff potentiometer provides for rapid and accurate calibration of the measuring instruments. The usual complement of galvanometers, keys, switches, etc., is at hand.

Photometrical Laboratory

A dark-room is equipped with a ten-foot photometer bench, a universal rotator of the National Bureau of Standards type, a Hefner primary standard of illuminating power, with secondary standard calibrated by the Electrical Testing Laboratory, Bunsen screen, etc., for making complete tests of all kind of incandescent lamps, with and without shades.

Special Electrical Apparatus

A 50,000 volt high-tension testing transformer is being installed and when completed will permit valuable experimental and research work by the student. Last year a new storage-battery consisting of sixty-one 120 ampere hour cells was purchased and is available for use at all times. This insures a constant and steady source of e. m. f. and current for all accurate work.

Practical Mechanics Equipment

For Pattern-work the equipment consists of wood-working machinery, modern work benches and tools necessary for pattern-work.

For Foundry-work the equipment consists of the best modern types of melting-furnaces with necessary apparatus for instruction in the principles of molding, core making, etc.

For Forge-work there are special forges and furnaces, of gas and coal-fired types, including annealing, hardening, and tempering furnaces, a special barium chloride furnace for the treatment of high-speed steels and a 100 pound air hammer.

For Machine-work there are modern belt and motor-driven machines, including screw-cutting lathes, speed lathes, milling machines, planer, shaper, drill-presses, grinding machines, power hacksaw, necessary accessory tools, etc.

METHODS OF ADMISSION

Admission is by one of the following methods:

1. Examination. Examinations are held at the University, beginning at 9 o'clock in the morning on the three days following the Commencement in June, and on the three days preceding the opening of the college year in September. For 1911 these fall on June 15, 16, and 17, and September 21, 22, and 23.

Certificates of College Entrance Examination Board are accepted in lieu of the entrance examination at the University.

2. Certificate from Accredited Schools. Instead of examination, certificates from high schools and academies whose work has been approved by the University, and whose courses prepare for the Freshman class will be accepted. The official blank of certificate provided by the University must be used. It may be obtained, by application, from the Registrar.

3. From Other Colleges. Students from other institutions whose entrance requirements are equivalent to those of the University of Pittsburgh and which offer equivalent courses of study will be credited with the work they have done in such colleges, and admitted to advanced standing without examination.

REQUIREMENTS FOR ADMISSION

All candidates for admission to the School of Engineering must be at least sixteen years of age and furnish testimonials of good moral character. Those who come from other colleges must present certificates of regular dismissal.

The student applying for admission must offer fifteen units, a unit being a subject in which the work done is the equivalent of four recitations per week of one hour each for one year, or five of three-quarters of an hour each.

For admission to the School of Engineering the student must offer ten units, in following subjects:

English, *a*, 3 units.
Mathematics, *a*, *c*, Algebra, 1½ units.
Mathematics, *b*, *d*, Plane and Solid Geometry, 1½ units.
History, *a*, *b*, *c*, *or d*, 1 unit
German or French, *a*, *b*, 2 units
Physics 1 unit.
Five additional units must be offered from following subjects:
Chemistry, 1 unit.
Biology, 1 unit.
Drawing, 1 unit.
Physiography, ½ unit.
Shop Work, 1 unit.
Advanced History, 1 unit.
Advanced English, 1 unit.
Latin, *a*, *b*, 1 to 2 units.
German, 2 units.
French, 2 units.

EXPLANATION OF REQUIREMENTS FOR ADMISSION

The following subjects are accepted for admission:

English Composition and Literature

a. Three units. The preparation should include the following subjects:

(1) GRAMMAR—It is expected that the applicant will be familiar with the essentials of English grammar, and will be able to explain the construction of sentences that occur in the literature he has read.

(2) COMPOSITION AND RHETORIC—The student should know the elementary principles of rhetoric, and should be able to apply them in the construction of sentences and paragraphs, and in the planning of essays. The examination is chiefly practical, and involves the ability to write good English.

No student will be accepted whose paper is notably deficient in logical development of the subject, or in such details of form as spelling, punctuation, grammar, and division into paragraphs.

(3) LITERATURE—The books recommended are the Uniform College Entrance requirements in English. Other similar works will be accepted as equivalents.

The candidate is required to write one or more paragraphs on each of several subjects chosen from a considerably larger number given in the examination paper. The questions on all of the books assume a knowledge of subject-matter and structure, but those on the books prescribed for study and practice call for more detailed treatment than those on books prescribed for reading.

A—The books prescribed for reading and practice are indicated in the following groups:

Select two sub-divisions from each of the following groups, except when substitution is made from group 2-5, as provided below. Each sub-division is set off by semicolons.

Group 1. The Old Testament, including the most important narrative parts of Genesis, Exodus, Joshua, Judges, Samuel, Kings and Daniel, together with the books of Ruth and Esther; the Odyssey, with the omission of Books I-V, XV-XVII; the Iliad with the omission of Books XI, XIII-XV, XXI; Virgil's Æneid. English translations of the Odyssey, the Iliad, and the Æneid, of acknowledged literary merit, must be used.

An equivalent amount from Groups 2-5 may be substituted for the two sub-divisions of this group.

Group 2. Shakespeare's *Julius Cæsar; The Merchant of Venice; As You Like It; A Midsummer-Night's Dream; Twelfth Night; Henry V.*

Group 3. Goldsmith's *The Vicar of Wakefield;* either Scott's *Ivanhoe* or Scott's *Quentin Durward;* Hawthorne's *The House of the Seven Gables;* Thackeray's *Henry Esmond;* either Dickens's *David Copperfield,* or Dickens's *A Tale of Two Cities;* Mrs. Gaskell's *Cranford;* George Eliot's *Silas Marner;* Stevenson's *Treasure Island;* Defoe's *Robinson Crusoe,* Part 1.

Group 4. The de Coverley Papers in *The Spectator;* Franklin's *Autobiography;* Bunyan's *Pilgrim's Progress,* Part I; Irving's *Sketch-Book;* Macaulay's Essays on Clive and Hastings; Thackeray's *English Humorists;* selections from Lincoln, including at least the two Inaugurals, the speeches in Independence Hall and at Gettysburg, the *Last Public Address,* and the *Letter to Horace Greeley,* together with a short memoir or estimate; Parkman's *Oregon Trail;* Thoreau's *Walden;* Huxley's *Autobiography* and selections from *Lay Sermons,* including addresses on *Improving Natural Knowledge, A Liberal Education,* and *A Piece of Chalk;* Stevenson's *Inland Voyage* and *Travels With a Donkey.*

Group 5. Palgrave's *Golden Treasury* (First Series), Books II and III, with special attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's *Elegy in a Country Churchyard* and Goldsmith's *The Deserted Village;* Coleridge's *The Ancient Mariner* and Lowell's *The Vision of Sir Launfal;* Scott's *The Lady of the Lake;* Byron's *Childe Harold,* Canto IV, and *The Prisoner of Chillon;* Palgrave's *Golden Treasury,* (First Series), Book IV, with special reference to Wordsworth, Keats, and Shelley; Poe's *The Raven,* Longfellow's *The Courtship of Miles Standish,* and Whittier's *Snow-Bound;* Macaulay's *Lays of Ancient Rome,* and Arnold's *Sohrab and Rustum;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and

The Passing of Arthur; Browning's *Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, Herve Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City.*

B—The books prescribed for study and practice are:

Shakespeare's *Macbeth; Milton's Lycidas, Comus, L'Allegro,* and *Il Penseroso;* Burke's *Speech on Conciliation with America,* or Washington's *Farewell Address and Webster's First Bunker Hill Oration;* Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns.*

Applicants who are not graduates of accredited high schools, or who have not passed the uniform entrance examinations, will be required to present themselves at the University of Pittsburgh entrance examinations, held the three days preceding the opening of the fall term.

b. One unit.

Advanced standing in English may be given to the graduates of high schools that have exceptionally strong and thorough courses in English thruout the entire four years. This requires additional work in literature and, especially, a thoro knowledge of the elementary principles of rhetoric, and the ability to write good English.

Mathematics

a. ALGEBRA THRU QUADRATICS

One unit. The four fundamental operations for rational algebraic expressions. Factoring, determination of highest common factor and lowest common multiple by factoring. Fractions, including complex fractions, ratio, and proportion. Linear equations, both numerical and literal, containing one or more unknown quantities. Problems depending on linear equations. Radicals, including the extraction of the square root of polynominals and of numbers. Exponents, including the fractional negative.

Quadratic equations, both numerical and literal. Simple cases of equations with one or more unknown quantities, that can be solved by the methods of linear or quadratic equations. Problems depending on quadratic equations. The binomial theorem for positive integral exponents.

b. PLANE GEOMETRY

One unit. The usual theorems and constructions of the textbooks, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas, regular polygons and the measurement of the circle. The solution of numerous original exercises. Applications to mensuration.

c. ADVANCED ALGEBRA

One-half unit. Ratio, proportion and variation, variables and limits, properties of series, including the binomial theorem for exponents of all kinds; the progressions; use of undetermined coefficients; permutations and combinations; logarithms, computation and use; summation of recurring series; method of differences; interpolation.

d. SOLID GEOMETRY

One-half unit. The usual theorems and constructions of good textbooks, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders, and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including loci problems. Applications to the mensuration of surfaces and solids.

History

One unit each.

a. Ancient history, with special reference to Greek and Roman history, and including also a short introductory study of the more ancient nations and the chief events of the early Middle Ages, down to the death of Charlemagne (814).

b. Mediæval and modern European history, from the death of Charlemagne to the present time.

c. English history.

d. American history and civil government.

Each of the above topics is intended to represent one year of historical work, wherein the study is given five times a week, or two years of historical work, wherein the study is given three times a week.

Latin

One unit each.

a. Grammar and elementary prose composition. A thoro knowledge of all regular inflections, all common irregular forms, the fundamentals of syntax, and a select vocabulary.

b. Cæsar, Gallic War, books I-IV, or the equivalent from other books of the Gallic War or the Civil War, or Nepos' Lives. The examination consists of translation at sight of narrative prose similar to the above.

c. Cicero, the four orations against Catiline and the orations for Archias and for the Manilian Law, or the equivalent from other orations of Cicero or from his letters, or from Sallust's Catiline and Jugurtha, except that the orations for the Manilian Law and for Archias are required. Advanced prose composition. The examination consists of translation (together with historical, literary, and grammatrical questions) partly of passages taken from the two required orations, and partly at sight of passages similar to the above in vocabulary, syntax, and range of ideas. In addition, there is an examination in prose composition.

d. Virgil, Æneid, books I-VI, or the equivalent from other books of the Æneid, or from the Bucolics or Georgics, or from Ovid Metamorphoses, Fasti, or Tristia, except that Æneid I, II and either IV or VI are required. The examination consists of translation (together with questions on grammar, prosody, literary and historical allusions, and subject-matter) partly of passages taken from the required books, and partly at sight of passages similar to the above in vocabulary, syntax, and range of ideas.

Greek

One or two units.

a. Greek Grammar and the elements, forms, constructions, conditional sentences and indirect discourse, etc. Composition. Translation into Greek of easy Attic prose based on the *Anabasis.*

b. Xenophon's *Anabasis.* Four books, Homer: Books I and II of the *Iliad.*

German

One unit each.

a. ELEMENTARY GERMAN. During the first year the work should comprise (1) careful drill upon pronunciation; (2) the memorizing and frequent repetition of easy colloquial sentences; (3) drill upon the rudiments of grammar; (4) abundant easy exercises designed, not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (5) the reading from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lessons.

b. SECOND YEAR GERMAN. During the second year the work should comprise (1) the reading of from 150 to 200 pages of literature in the form of easy stories and plays; (2) practice as before, in the translation into German of easy variation upon the matter read, and also in the reproduction, orally and in writing, of the substance of short and easy selected passages; (3) continued drill upon the rudiments of grammar.

Stories suitable for the elementary course can be selected from the following list: Grimms' *Maerchen,* Gerstaecker's *Germelshausen,* Heyse's *L'Arrabbiata,* Storm's *Immense,* Baumbach's *Der Schwiergersohn,* Schokke's *Der Zerbrochene Krug,* Hillern's *Hoeher als Die Kirche.*

Among shorter plays the best available are perhaps: Benedix's *Der Prozess, Der Weiberfreund;* Elz's *Er ist nich eifersuechtig;* Wichert's *An der Majorsecke;* Wilhelm's *Einer muss heiraten.*

c. THIRD YEAR GERMAN. The work should comprise the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatrical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tense and modes, and likewise upon word-order and word-formation.

Suitable reading matter for the third year can be selected from such works as the following: Freytag's *Die Journalisten* and *Bilder aus der Deutschen Vergangenheit*—for example, *Karl der Grosse, Aus den Kzeuzzuegen, Doktor Luther, Aus dem Staat Friedrichs des Grossen,* Gerstæcker's *Irrfahrten,* Hoffman's *Historische. Erzaehlungen,* Riehl's *Der Fluch der Schoenheit,* Schiller's *Wilhelm Tell, Der Neffe als Onkel, Das Lied von der Glocke,* Wildenbruch's *Das edle Blut.*

French

One unit each.

a. ELEMENTARY FRENCH. In the first year the work should comprise (1) careful drill in pronunciation; (2) the rudiments of grammar; (3) easy composition; (4) the reading of from 150 to 200 duodecimo pages of easy French prose; (5) the writing of French from dictation.

b. SECOND YEAR FRENCH. During the second year the student should read from 300 to 400 pages of easy modern prose. Suitable texts are: Halévy's *L' Abbé Constantin;* Bruno's *Le tour de la France;* Malot's *Sans famille;* Labiche and Martin's *La poudre aux yeux* and *Le voyage de M. Perrichon;* Dumas' *L' Evasion du Duc de Beaufort.* Continued drill upon the rudiments of grammar, the mastery of the chief irregular verbs, dictation, practice in French conversation.

c. THIRD YEAR FRENCH. In the third year from 500 to 600 pages of French of ordinary difficulty should be read. The essentials of French syntax are required, with constant practice in the use of spoken French. Suitable texts are: Daudet's *Contes;* About's *Le Roi des Montagnes;* Merimée's *Colomba;* Augier's *Le Gendre de M. Poirer;* Mollière's *Le Bourgeois Gentilhomme;* Maupassant's *Contes;* George Sand's *La Mare au Diable;* Scribe's plays.

Physics

One unit.

The candidate will be expected to be familiar with the fundamental principles of Physics. A sufficiently extended treatment of the subject will be found in any of the principal text-books now in use in secondary schools, such, for instance, as Milliken and Gale, Carhart and Chute, Hoadley, Mann, and Twiss.

It is furthermore very desirable for the student to have received training in laboratory work; but for the present no laboratory work will be required.

Chemistry

One unit. The knowledge gained, if elementary, should be comprehensive and exact, including facts and laws. Laboratory work, emphasizing descriptive chemistry is necessary and notes of this work must be presented. Much attention should be given to solution of problems.

Biology

One unit. Under this one head are grouped the subjects of botany, zoölogy, and physiology. The one unit may be composed of a single subject or of any combination of two. Laboratory exercises or field work equal in time at least to that given to text-book and lecture is essential. In offering subject for credit the names of the text-books used should be given.

Physiography

One-half unit. This subject, otherwise known as physical geography, must have been pursued as a special subject and not as a part of the earlier study of general geography, and a standard text-book, dealing with the subject solely must have been used.

Drawing

One unit. Either free-hand or mechanical drawing, or both, may be offered. Specimens of the work done must be presented, properly certified by the instructor, with a statement of the length of time taken in the course which they represent.

Shop-Work

One unit. The work done must usually have been of the systematic kind prescribed in courses of manual training.

CONDITIONS

No student with more than three units of entrance conditions will be admitted to regular classification. Conditions must be partly removed before the second year, and wholly before the third.

Advanced Standing.—Students entering with more than 15 units may receive college credit for high school work in excess of the 15 only by taking special examination in this work on entering the University.

Students in the School of Engineering who fail in 50 per cent of their work shall not be registered in the following term except by special action of the faculty. For this purpose, two reexaminations will count as one failure.

TUITION AND FEES

The tuition covers all fees except those specified below and must be paid upon registration, with all current fees, before name can be entered on class rolls.

Tuition

First term, every year	$ 40.00
All other terms, each	35.00
If paid in advance for three (3) terms	105.00

Fees

Matriculation, payable on admission to University	$ 5.00
Diploma	5.00
Gymnasium, each term	2.00
Chemistry, each course	5.00
Biology, one course	3.50
Biology, each additional course	1.75
Engineering Laboratory, each term	5.00
Shop, each term	5.00

DEGREES IN ENGINEERING

The degrees conferred upon those who have been in residence during their last year and who shall complete satisfactorily the courses offered by the School of Engineering will be respectively:

Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, Bachelor of Science in Electrical Engineering, Bachelor of Science in Chemical Engineering, Bachelor of Science in Sanitary Engineering.

Upon giving evidence of having successfully practiced engineering for a period of at least three years, accompanied by a satisfactory thesis showing the application of engineering principles to some important project, the corresponding engineering degree will be conferred upon graduates of this school.

ADVANCED STANDING IN ENGINEERING COURSES

Graduates of the College of this University, or of any other college of high standing, who desire to prepare themselves for the engineering profession, will be matriculated in the School of Engineering upon presentation of their diplomas and evidence that they have pursued mathematical and scientific studies justifying their entering one of the advanced classes. By availing themselves of this provision graduates from classical or general scientific courses may obtain a professional training in engineering in two or three years after taking a first degree, and may enter upon their practical work with a broader education than can be obtained by taking a regular engineering course. Students of the University, in the College, will be advised as to the best selection of electives to make, to the end that they may enter an engineering course for an additional degree at as high a point as possible and with the fewest conditions.

COURSES IN ENGINEERING

The several courses in engineering, are planned to meet fully the requirements of prospective engineers, but are subject to some modification in the case of students who are preparing for a special branch of the engineering profession. Proposed substitutes for prescribed courses must be approved by the heads of the departments concerned, at least two weeks before the beginning of the term in which such courses are scheduled.

All regular courses are made up of eleven terms of eleven to twelve weeks each, spent in school, and four terms spent in the engineering industries of the Pittsburgh district, making a total of fifteen terms' work required for graduation.

The schedule of work in the co-operative plan adopted is as follows: during the Freshman year, the last term of the Sophomore year, and the whole of the Senior year, all students of the same class are together in school. During the rest of the time, each class is divided into two sections which alternate quarterly between school and practical work. The first year's work is the same for all, and lays a broad foundation for any engineering course, at the same time giving the student a year in which to become so familiar with the different courses that he may decide which to pursue, with greater confidence in his choice.

Mechanical Railway Engineering

A Department of Mechanical Railway Engineering has been organized under the direction of Mr. D. F. Crawford, General Superintendent of Motive Power, Pennsylvania Lines West of Pittsburgh, to serve the interests of those students who desire to specialize along this line.

To a thorough foundation of the elements of Mechanical Engineering will be added those subjects which will contribute most toward preparation for Railroad work. Further details concerning this course will be announced later.

The course in Sanitary Engineering consists of the fundamentals of Civil Engineering, as Surveying, Topography, Structures, Mechanics, Hydraulics, and Economics; together with special training in sanitary chemistry, biology, and bacteriology, with lectures in hygiene, public health, epidemiology, vital, and sanitary statistics, for the purpose of studying the principles of various municipal problems of water systems, water purification, sewerage systems, sewage disposal, refuse and waste collection and disposal. Coöperation with the Medical School has been arranged in order that all subjects may be given along the broadest lines.

The provisional outline of this course is given on page 143, subject to more or less change as the course develops.

COURSE IN CIVIL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	2	43	5	5	7 5	43 43	2 3	2 3	8	43	3	3
Chem	1	45	8	4	2	45	8	4	8	45	8	4
Graph	1	25	3	1	2	25	3	1	3	25	6	2
P. Mech.	1	27	7	3	2	27	7	3	3	27	7	3
C. Eng	......	....	......	......	......	....	......	......	1	28	5	3
Ger. or Rom.	1	49, 50	3	3	2	49, 50	3	3	3	49, 50	3	3
Engl.	1	48	3	3	2	48	3	3	3	48	2	2
Pub. Sp.	1	48	1	1	2	48	1	1				
Phys. Ed	......	....	3	1	......	....	3	1	......	....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	43	4	4	10	43	4	4				
Phys.	11	44	7	5	12	44	7	5	13	44	7	5
Graph	4	25	6	2	5	25	8	4				
C. Eng	2	29	7	3	3	29	3	1	5	29	8	4
C. Eng	......	....	......	......	19	32	1	1	19	32	1	1
Psych.	......	....	......	......	......	....	......	......	11	47	3	3
Biol.	......	....	......	......	3	46	4	2				
Min.	......	....	......	......	......	....	......	......	1	47	7	3
Mech.	......	....	......	......	......	....	......	......	1	26	5	5
Ger. or Rom.	7	49, 50	3	3	8	49, 50	3	3				
Engl.	*7	48	3	3								
Phys. Ed	......	....	3	1	......	....	3	1	......	....	3	1
*or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech.	2	26	5	5	5	27	4	4				
Mech.	3	26	6	2	6	27	3	1				
Mech.	4	26	7	3								
C. Eng	6	29	4	2	7	30	2	2				
C. Eng	19	32	1	1	15	31	5	5				
C. Eng	......	....	......	......	19	32	1	1				
E. Eng	2	37	5	3								
M. Eng.	......	....	......	......	4	33	5	3				
Geol.	5	47	3	3	6	47	3	3				
Econ	3E	29	3	3								
Astron.	......	....	......	......	1	48	3	3				
	FALL TERM				WINTER TERM				SPRING TERM			
C. Eng	4	29	6	4	10	30	6	2	12	31	5	3
C. Eng	8	30	3	3	11	30	7	3	14	31	4	2
C. Eng	9	30	6	2	13	31	4	2	18	32	10	4
C. Eng	16	32	10	4	17	32	10	4				
C. Eng	19	32	1	1	19	32	1	1	19	32	1	1
C. Eng	20	32	3	1	20	32	3	1	20	32	3	1
C. Eng	......	....	......	......	21	33	......	2	21	33		4
Econ	10	41	2	2	11	41	2	2				
Econ	13	42	2	2	16	42	2	2	46	43	3	3
Econ	21	42	2	2	24	42	2	2				
M. Eng	......	....	......	......	......	....	......	......	15	36	5	3

COURSE IN MECHANICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	2	43	5	5	7 5	43 43	2 3	2 3	8	43	3	3
Chem	1	45	8	4	2	45	8	4	8	45	8	4
Graph	1	25	3	1	2	25	3	1	3	25	6	2
P. Mech	1	27	7	3	2	27	7	3	3	27	7	3
C. Eng	......	......	......	......	......	......	......	......	1	28	5	3
Ger. or Rom	1	49, 50	3	3	2	49, 50	3	3	3	49, 50	3	3
Engl	1	48	3	3	2	48	3	3	3	48	2	2
Pub. Sp	1	48	1	1	2	48	1	1				
Phys. Ed	......	......	3	1	......	......	3	1	......	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	43	4	4	10	43	4	4				
Phys	11	44	7	5	12	44	7	5	13	44	7	5
Graph	4	25	6	2	5	25	8	4				
Mech	......	......	......	......	......	......	......	......	1	26	5	5
P. Mech	4	28	4	2	5	28	4	2	6	28	4	2
Ger. or Rom	7	49, 50	3	3	8	49, 50	3	3	9	49, 50	3	3
Engl	*7	48	3	3								
Biol	......	......	......	......	3	46	4	2				
Min	......	......	......	......	......	......	......	......	1	47	7	3
Psych	......	......	......	......	......	......	......	......	11	47	3	3
Phys. Ed	......	......	3	1	......	......	3	1	......	......	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	26	5	3	5	27	4	4				
Mech	3	26	6	2	6	27	3	1				
M. Eng	1	33	5	3	2	33	8	4				
M. Eng	......	......	......	......	4	33	5	3				
P. Mech	7	28	3	1								
E. Eng	3	37	5	3	4	38	5	3				
C. Eng	......	......	......	......	7	30	2	2				
Phys	......	......	......	......	15	44	4	2				
Econ	3E	41	3	3								
	FALL TERM				WINTER TERM				SPRING TERM			
M. Eng	3	33	7	3	6	34	2	2	10	35	3	3
M. Eng	5	34	4	4	7	34	1	1	11	35	5	3
M. Eng	16	36	3	1	8	34	5	3	12	35	5	3
M. Eng	17	37	1	1	9	35	7	3	14	36	3	1
E. Eng	5	38	5	3								
C. Eng	16	32	10	4								
C. Eng	9	30	6	2								
M. Eng	......	......	......	......	13	36	6	2	15	36	5	3
M. Eng	......	......	......	......	16	36	3	1	16	36	3	1
M. Eng	......	......	......	......	17	37	1	1	17	37	1	1
M. Eng	......	......	......	......	18	37	......	3	......	......	......	3
Econ	13	42	2	2	16	42	2	2	46	43	3	3
Econ	21	42	2	2	24	42	2	2				

COURSE IN ELECTRICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	2	43	5	5	{7 {5	43 43	2 3	2 3	8	43	3	3
Chem	1	45	8	4	2	45	8	4	8	45	8	4
Graph	1	25	3	1	2	25	3	1	3	25	6	2
P. Mech	1	27	7	3	2	27	7	3	3	27	7	3
C. Eng	......	......	......	......	......	......	......	......	1	28	5	3
Ger. or Rom	1	49, 50	3	3	2	49, 50	3	3	3	49, 50	3	3
Engl	1	48	3	3	2	48	3	3	3	48	2	2
Pub. Sp	1	48	1	1	2	48	1	1				
Phys. Ed	......	......	3	1	......	......	3	1	......	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	43	4	4	10	43	4	4				
Phys	11	44	7	5	12	44	7	5	13	44	7	5
Graph	4	25	6	2	5	25	8	4				
Mech	......	......	......	......	......	......	......	......	1	26	5	5
P. Mech	4	28	4	2	5	28	4	2	6	28	4	2
Ger. or Rom	7	49, 50	3	3	8	49, 50	3	3	9	49, 50	3	3
Engl	*7	48	3	3								
Biol	......	......	......	......	3	46	4	2				
Min	......	......	......	......	......	......	......	......	1	47	7	3
Psych	......	......	......	......	......	......	......	......	11	47	3	3
Phys. Ed	......	......	3	1	......	......	3	1	......	......	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	26	5	5	5	27	4	4				
Mech	3	26	6	2	6	27	3	1				
Math	11	44	2	2								
Phy	14	44	7	3	15	44	7	3				
E. Eng	1	37	5	5	6	38	3	3				
E. Eng	15	39	3	1	16	39	3	1				
M. Eng	......	......	......	......	2	33	8	4				
M. Eng	......	......	......	......	4	33	5	3				
Econ	3E	41	3	3								
	FALL TERM				WINTER TERM				SPRING TERM			
E. Eng	7	38	3	3	8	38	3	3	9	38	3	3
E. Eng	10	38	3	3	11	39	3	3	12	39	3	3
E. Eng	13	39	8	4	14	39	8	4	19	40	6	2
E. Eng	17	40	6	2	18	40	6	2	20	40	1	1
E. Eng	20	40	1	1	20	40	1	1	22	40	7	3
E. Eng	......	......	......	......	22	40	6	2				
Phys	......	......	......	......	30	44	3	3	31	44	3	3
M. Eng	5	34	4	4	......	......	......	......	15	36	5	3
Econ	13	42	2	2	16	42	2	2	46	43	3	2
Econ	21	42	2	2	24	42	2	2				

COURSE IN CHEMICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	2	43	5	5	7 5	43 43	2 3	2 3	8	43	3	3
Chem	1	45	8	4	2	45	8	4	8	45	8	4
Graph.	1	25	3	1	2	25	3	1	3	25	6	2
P. Mech	1	27	7	3	2	27	7	3	3	27	7	3
C. Eng	......	......	......	......	......	......	......	......	1	28	5	3
Ger. or Rom.	1	49,50	3	3	2	49,50	3	3	3	49,50	3	3
Engl	1	48	3	3	2	48	3	3	3	48	2	2
Pub. Sp	1	48	1	1	2	48	1	1				
Phys. Ed	......	......	3	1	......	......	3	1	......	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	43	4	4	10	43	4	4				
Phys	11	44	7	5	12	44	7	5	13	44	7	5
Graph.	4	28	6	2	5	28	8	4				
Chem	9	45	7	3	10	45	7	3	11	45	7	3
Ger. or Rom.	7	49,50	3	3	8	49,50	3	3	9	49,50	3	3
Engl	7*	48	3	3								
Min	......	......	......	......	......	......	......	......	1	47	7	3
Phys. Ed	......	......	3	1	......	......	3	1	......	......	3	1
Mech	......	......	......	......	......	......	......	......	1	26	5	5
*or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	26	5	5								
Mech	3	26	6	2								
Chem	12	45	7	3								
Chem	15	45	8	4	16	46	8	4				
E. Eng	3	37	5	3	4	37	8	4				
M. Eng	......	......	......	......	2	33	8	4				
M. Eng	......	......	......	......	4	38	5	3				
Phys	14	44	4	2	15	44	4	2				
Econ	3E	41	3	3								
	FALL TERM				WINTER TERM				SPRING TERM			
Chem	27	46	2	2	28	46	2	2	29	46	2	2
Chem	21	46	2	2	22	46	2	2	23	46	2	2
E. Eng	5	38	5	3								
M. Eng	5	34	4	4	6	34	2	2	11	35	5	3
M. Eng	16	36	......	......	7	34	1	1	15	36	5	3
Phys									16	44	3	1
Econ	13	42	2	2	16	42	2	2	46	43	3	3
C. Eng	8	30	3	3								
Thesis	......	......	......	......	......	......	......	5	......	......	......	5
Inspection												
Visits												
Reports	......	......	......	......	......	......	3	1	......	......	3	1

COURSE IN SANITARY ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	2	43	5	5	{5 7	43 43	2 3	2 3	8	43	3	3
Chem	1	45	8	4	2	45	8	4	8	45	8	4
Graph.	1	25	3	1	2	25	3	1	3	25	6	2
P. Mech.	1	27	7	3	2	27	7	3	3	27	7	3
C. Eng.	......	......	......	......	......	......	......	......	1	28	5	3
Ger. or Rom.	1	49, 50	3	3	2	49, 50	3	3	3	49, 50	3	3
Engl.	1	48	3	3	2	48	3	3	3	48	2	2
Pub. Sp.	1	48	1	1	2	48	1	1				
Phys. Ed.	......	......	3	1	......	......	3	1	......	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	43	4	4	10	43	4	4				
Phys.	11	44	7	5	12	44	7	5	13	44	7	5
Graph.	4	25	6	2	5	25	8	4				
C. Eng.	2	29	7	3	3	29	3	1				
Ger. or Rom.	7	49, 50	3	3	8	49, 50	3	3	9	49, 50	3	3
Eng.	*7	48	3	3								
Chem.	......	......	......	......	9	45	7	3	10	45	7	
Biol.	......	......	......	......	3	46	4	2				
Min.	......	......	......	......	......	......	......	......	1	47	7	3
Psych.	......	......	......	......	......	......	......	......	11	47	3	3
Mech.	......	......	......	......	......	......	......	......	1	26	5	5
Phys. Ed.	......	......	3	1	......	......	3	1	......	......	3	1
*or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech.	2	26	5	5	5	27	4	4				
Mech.	3	26	6	2	6	27	3	1				
Mech.	4	26	7	3								
Chem.	34		6	2								
Biol.	17	46	7	4	18	46	7	4				
M. Eng.	......	......	......	......	4	33	5	3				
C. Eng.	......	......	......	......	7	30	2	2				
E. Eng.	3	44	5	3								
Biol.	21	47	2	2								
San. Bld.	......	......	......	......	22		2	2				
Astron.	......	......	......	......	1	48	3	3				
	FALL TERM				WINTER TERM				SPRING TERM			
Biol.	19	47	7	4			4	4	23		3	3
M. Eng.	5	34	4	4	......	......	......	......	11	35	5	3
C. Eng.	8	30	3	3	11	30	7	3	14	31	4	2
C. Eng.	9	30	6	2	13	31	4	2				
C. Eng.	16	32	10	4	17	32	10	4				
Econ.	13	42	2	2	16	42	2	2	46	43	3	3
Econ.	......	......	......	......	......	......	......	......			2	2
Thesis.	......	......	......	......	......	......	......	......	......	......	3	3
Inspection												
Visits												
Reports	......	......	3	1	......	......	3	1	......	......	3	1

Graphics

1. Mechanical Drawing

Mr. Lambie Fall Term, 1 credit

The care and use of drafting instruments, instrument exercises, geometrical constructions, lettering, shading, exercises in drawing to scale, and dimensioning.

Three hours per week in drafting room. Freshman year.

2. Mechanical Drawing

Mr. Lambie Winter Term, 1 credit

Orthographic projections, rotation of objects, oblique projections, intersections, and development of surfaces.

Three hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 1.

3. Mechanical Drawing

Mr. Lambie Spring Term, 2 credits

Isometric drawing and dimensioning, sectioning, and machine drawing.

Six hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 2.

4. Mechanical Sketching and Drafting

Mr. Lambie Summer or Fall Term, 2 credits

Graded exercises in the measuring and sketching of mechanical constructions, and the subsequent detail drafting of the same.

Six hours per week in drafting room. Sophomore year.

Pre-requisite: Graphics 3.

5. Descriptive Geometry

Mr. Lambie Winter or Spring Term, 4 credits

A critical study of the science of representing by drawing. The location of points, lines, planes, single curved surfaces, surfaces of revolution, and warped surfaces, with their relations to each other; tangent lines and planes; intersection of surfaces; shades, shadows, and perspective.

Two lectures and six hours in drafting room per week. Sophomore year.

Pre-requisites: Graphics 4; Mathematics 7.

6. APPLIED DESCRIPTIVE GEOMETRY

PROFESSOR SMITH 2 credits

The application of descriptive geometry and advanced drawing to engineering problems, including patterns of the developable surfaces, templets in true proportions, and detailed isometric drawings of various parts of the structures. Also, practice in the construction of templets, patterns, etc., with their use.

Six hours drawing per week.

Elective in all engineering courses.

Pre-requisite: Graphics 5.

Mechanics

1. ANALYTIC MECHANICS

PROFESSOR FROST Summer Term, (1912), 5 credits

This subject comprises among its topics the composition and resolution of forces, the center of gravity, the moment of inertia, radius of gyration, laws of friction and of motion, projectiles, impact, machines, work, and energy. The solution of numerous problems in application of formulas is constantly required.

Five recitations and lectures per week. Sophomore year.

Pre-requisite: Mathematics 10.

2. MECHANICS OF MATERIALS

MR. LAMBIE Fall or Winter, 5 credits

The resistance and elasticity of materials. The action of beams under various conditions of fixity and loading; strength of columns and shafts; combined stresses; resilience of materials; etc.

Five recitations and lectures per week. Junior year.

Pre-requisite: Mechanics 1.

3. MECHANICAL LABORATORY

MR. RICHARDSON Fall or Winter Term, 2 credits

The experimental study of the physical properties of the materials of construction, such as iron and steel, wood, brick, stone, cement, and concrete.

Six laboratory-hours per week. Junior year.

To be taken concurrently with Mechanics 2.

4. GRAPHIC STATICS

MR. BANKSON Fall or Winter Term, 3 credits

The solution of problems in which the stresses in frame work, beams, roof and bridge trusses are ascertained by graphical methods. Methods for dead, snow, wind, and live loads.

One lecture and six hours drawing per week. Junior year.
Pre-requisites: Graphics 1; Mechanics 1.

5. HYDRO-MECHANICS AND HYDRAULICS
MR. RICHARDSON Spring or Summer Term, 4 credits

The equilibrium and pressure of liquids; the motion and work of fluids; the flow of water through orifices, over weirs, in pipes, and in canals; measurements of water power; and hydraulic machinery.

Four recitations and lectures per week. Junior year.
Pre-requisites: Mechanics 1; Mathematics 10.

6. HYDRAULIC LABORATORY
MR. RICHARDSON Spring or Summer Term, 1 credit

The experimental study of the flow of water through pipes, nozzles, and orifices, and over weirs. Capacity and efficiency tests of hydraulic turbine pumps and motors.

Three laboratory hours per week. Junior year.
To be taken concurrently with Mechanics 5.

Practical Mechanics

1. FRAME WORK AND PATTERN MAKING
MR. WEBER AND MR. HEATLEY Fall Term, 3 credits

Lectures are given on the use of wood-working tools, and the laying out and construction of frame work, templets, patterns and core boxes. The student is required to execute in the University Shops a graded set of exercises in the construction of simple frame-work, patterns, and core boxes. Inspection trips, on which written reports are required, are taken during shop hours when deemed advantageous.

One lecture and six shop hours per week. Freshman year.

2. FOUNDRY WORK
MR. WEBER AND MR. HEATLEY Winter Term, 3 credits

Lectures are given on the principles and practice of moulding and founding of metals. The student is required to execute in the University Shops a graded set of exercises in moulding and core making, together with the melting and casting of metals. Frequent inspection trips, on which written reports are required, are taken during shop hours to local foundries. Freshman year.

3. FORGE WORK
MR. WEBER AND MR. THOMPSON Spring Term, 3 credits

Lectures are given on the principles and practice of forging and the heat treatment of metals. The student is required to execute in the University Shops a series of exercises in the forging, welding, riveting, and case-hardening of soft steel and iron; and the forging and heat treatment of the various grades of tool steel. Inspection trips, on which written reports are required, are taken during shop hours when deemed advantageous.

One lecture and six shop hours per week. Freshman year.

4. MACHINE WORK IN METALS
MR. WEBER — Summer or Fall Term, 2 credits

Lectures are given on modern machine tools and machine shop practice. The student is required to execute in the University Shops a graded set of exercises in making measurements; and in the use of lathes, planers, shapers, milling machines, grinders, etc.; and in the assembling of machine parts. Frequent inspection trips, on which written reports are required, are taken during shop hours to local machine shops.

One lecture and three shop hours per week. Sophomore year.

5. MACHINE WORK IN METALS
MR. WEBER — Winter or Spring Term, 2 credits

This course is a continuation of Course No. 4.

One lecture and three shop hours per week. Sophomore year.

6. MACHINE WORK IN METALS
MR. WEBER — Summer Term, 2 credits

This course is a continuation of Courses Nos. 4 and 5.

One lecture and three shop hours per week. Sophomore year.

7. INVESTIGATION WORK — 1 credit

The object of this course is to develop initiative and to enable the student to follow up any phase of his course in practical mechanics in which he may be particularly interested; and for which he shall receive one credit when the written report of his investigation has been received and accepted by the professor in charge.

Three shop hours per week.

Civil Engineering

1. SURVEYING
MR. BANKSON — Spring Term, 3 credits

Lectures, recitations, and field work in the theory, use, and care of surveying instruments. The field work consists of measuring lines and angles; determining areas, running levels, dividing of land, re-location of boundaries, staking out of buildings, etc. Methods of keeping notes are explained, and notes and plots are required of every student.

Two recitations and three hours field work per week. Freshman year.

Pre-requisite: Mathematics 5.

2. TOPOGRAPHY

MR. BANKSON — Summer or Fall Term, 3 credits

A course in topographical surveying, including the theory and practice of transit, plane table and stadia methods. Also the applications of railroad, highway, municipal, and hydrographical surveying.

A complete topographic survey is executed. Complete notes and a topographical map are required of every student.

One recitation and six hours field work per week. Sophomore year.

Pre-requisite: C. E. 1.

3. TOPOGRAPHY

MR. BANKSON — Winter or Spring Term, 1 credit

A continuation of Course C. E. 2.

Three hours drawing per week. Sophomore year.

4. GEODESY

PROFESSOR SMITH — Fall Term, 4 credits

A study of the precise methods used in geodetic and topographical surveying. The mathematical development of the principles, and the application of the method of least squares, in finding the most probable values, and probable errors, of magnitudes observed in plane and geodetic surveys. Field work, including the measurement of base lines, triangulation and topography.

Three recitations and three hours field work per week. Senior year.

Pre-requisites: C. E. 3; Mathematics 10; Astronomy 1.

5. RAILROAD ENGINEERING, LCOATION

MR. BANKSON — Summer Term, 4 credits

The reconnoissance, the preliminary survey, and the staking out the center line. The student is required to perform the necessary mathematical calculations incident to the running of simple, compound, and transition curves, overcoming of obstacles, change of location, etc. The line is subsequently leveled, benches and reference points established, topography taken, and the profile made. The student is taught the best methods of keeping the field notes and of checking them, and is given exercises in the solution of problems pertaining to frogs and switches. turnouts and crossings, and the practical application of the same in the field.

Two recitations and six hours of field work per week. Sophomore year.

Pre-requisite: C. E. 3.

6. RAILROAD ENGINEERING, CONSTRUCTION

MR. BANKSON — Fall or Winter Term, 2 credits

The student is exercised in the means and methods of cross-sectioning, determination of grades, staking out excavations and embankments, calculating earth work, making estimates on haulage; the classification of earth work, staking out culverts, bridge piers, abutments, and tunnels. Forms and dimensions of tunnels are considered, together with the means and methods of excavation and cost of the work.

One recitation and three hours of calculations and estimates per week. Junior year.

Pre-requisite: C. E. 5.

7. MASONRY CONSTRUCTION AND FOUNDATIONS

MR. LAMBIE .. Spring or Summer Term, 2 credits

A study of the preparation, strength, and durability of building stones, bricks, common lime mortar, hydraulic cement mortar, and concrete; and the different kinds of masonry construction, such as dams, retaining walls, bridge piers and abutments; also the preparation of ordinary foundations, pile foundations, and foundations under water. Visits of inspection are made, when the opportunity offers, to see work in the process of construction.

Two recitations and lectures per week.

Pre-requisite: Mechanics 4.

8. CONCRETE ENGINEERING

PROFESSOR SMITH Fall Term, 3 credits

A study of the mechanics of reinforced concrete, together with applications to the design of typical structures in buildings, bridges, etc. This course should be taken with C. E., 9.

Three lecture hours per week. Senior year.

Pre-requisites: Mechanics 2 and 4.

9. ENGINEERING LABORATORY

PROFESSOR SMITH Fall Term, 2 credits

This course comprises laboratory work generally related to structural engineering in steel and concrete.

Six laboratory hours per week. Senior year.

Pre-requisites: Mechanics 2, 3, and 4.

10. ENGINEERING LABORATORY

PROFESSOR SMITH Winter Term, 2 credits

A continuation of Course C. E. 9.

Six laboratory hours per week. Senior year.

11. ARCHES AND RETAINING WALLS

MR. BANKSON Winter Term, 3 credits

Theory of arches; external forces; methods of failure by sliding, rotation, crushing. Methods of testing: stability, criteria of safety. Location of the line of resistance. Symmetrical and unsymmetrical loading. Curvature of linear arches. Rules and formulas derived from practice.

Design of retaining walls, including dams and methods of failure. Theoretical and empirical formulas.

One recitation and six hours design per week. Senior year.

Pre-requisite: C. E. 8.

12. ROADS AND PAVEMENTS

MR. BANKSON Spring Term, 3 credits

A study of the location, width and transverse section of roads and streets, together with a study of the materials used and methods of constructing or improving the surfaces of roads and pavements.

Two recitations and three hours laboratory per week. Senior year.

Pre-requisites: Geology 1; and Mechanics 3.

13. MUNICIPAL ENGINEERING

MR. LAMBIE Winter Term, 2 credits

The subject of water supply is taken up, dealing with the quantity required, the gauging of streams by means of floats, current meters, etc., computations to determine the necessary storage to insure a given supply, the design of standpipes, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of water.

Also the drainage of buildings and lands, the sewerage of cities and towns, the design of a sewerage system for a given district, and the study of the different methods of treatment and disposal of sewage.

One lecture and recitation, with three hours field work and designing per week. Senior year.

Pre-requisites: Mechanics 2 and 5.

14. MUNICIPAL ENGINEERING

MR. LAMBIE Spring Term, 2 credits

A continuation of Course C. E. 13.

One lecture and recitation and three hours design work per week. Senior year.

15. STRESSES IN TRUSSES, AND BRIDGE DESIGN

MR. BANKSON Spring or Summer Term, 5 credits

Methods of computing stresses in roof and bridge trusses. An account of the development of bridge building and the principles of economic design, followed by a complete analysis for the stresses of a roof truss, a plate girder bridge, a pin-connected bridge, and a critical study of other standard types. The varied forms of bridges in this vicinity, as well as the extensive bridge work here, offer exceptional opportunity to the student in this field of engineering activity. Supplemented by lectures. Junior year.

Five recitations and lectures per week.

Pre-requisites: Mechanics 2 and 4.

16. STRUCTURAL ENGINEERING

PROFESSOR SMITH — Fall Term, 4 credits

An elementary course in structural designing; including properties of rolled shapes of structural steel; structural shop methods; design and detailing of riveted joints, simple truss members, and minor trusses.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: Mechanics 4.

17. STRUCTURAL ENGINEERING

PROFESSOR SMITH — Winter Term, 4 credits

Structural engineering as applied in general; and detail designs of various steel-framed structures, including mill buildings, highway bridges, and plate-girder railroad bridges. The work consists of the complete analysis and design of the structures under a given set of specifications, followed by the practice of making complete general and detail drawings, with stress sheets, weight and cost data, and bills of material.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisites: C. E. 15 and 16.

18. STRUCTURAL ENGINEERING

PROFESSOR SMITH — Spring Term, 4 credits

A study of pin-connected bridge trusses of the various types. The work includes the general design and determination of stresses; the detail design and detail drawings of the structure, with stress sheets, weight and cost data.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: C. E. 17.

19. CURRENT ENGINEERING TOPICS

1 credit per term

The object of this course is to increase the student's knowledge of engineering practice as well as to train him in the presentation and discussion of themes in general. Instructors and students of all classes meet on equal terms.

The work consists of original papers, reviews, and general discussions on subjects pertaining to science and engineering.

One session hour per week. Sophomore, Junior, and Senior years.

Open to all students.

20. INSPECTION VISITS AND REPORTS

PROFESSOR SMITH — 1 credit per term

One afternoon in each alternate week is spent in the large industrial plants or at the site of one of the notable engineering structures of the

Pittsburgh district. A separate report dealing with the technical details of the inspection is required for each visit. Senior year.

Pre-requisites: C. E. 6 and 15.

21. THESIS

PROFESSOR SMITH Winter and Spring Terms, 3 credits each term

For the degree of B. S., in Civil Engineering, a thesis involving a large amount of original work in engineering must be presented in acceptable form and approved by the head of the department several days in advance of the date of graduation. The subject must be decided upon at a time not later than the ninth term of the student's course.

Mechanical Engineering

1. KINEMATICS

MR. RICHARDSON Fall or Winter Term, 3 credits

A study of the principles underlying the action of machine elements; the communication of motion by trains of gearing, pulleys, and belts; cams and link work; the different forms of gear teeth; automatic feed motions; quick return motions, etc.

Two recitations and three drawing hours per week. Junior year.

Pre-requisites: Graphics 5; Mathematics 10.

2. MACHINE DESIGN AND DRAWING

MR. RICHARDSON Spring or Summer Term, 4 credits

The proportioning of machine elements, such as shafting, pulleys, cranks, gears, cylinders, and frames. The knowledge thus gained is applied in the complete design of machines to fulfil certain requirements.

Two recitations and lectures and six drawing hours per week. Junior year.

Pre-requisites: Graphics 5; Mechanics 2; M. E. 1.

3. MACHINE DESIGN AND DRAWING

MR. RICHARDSON Fall Term, 3 credits

Continuation of Course M. E. 2.

One recitation and lecture and six drawing hours per week. Senior year.

4. PRIME MOVERS

MR. RICHARDSON Spring or Summer Term, 3 credits

A brief study of the construction and operation of steam boilers, engines and turbines; and of gas engines and producers.

Two lectures and three laboratory hours per week. Junior year.

Pre-requisites: Mechanics 1; Physics 13.

5. THERMODYNAMICS

PROFESSOR STEWART Fall Term, 4 credits

A study of the general principles of energetics, the cycle, the thermal properties of matter, the steam engine cycle, the laws of gases, gas-engine cycles, refrigerating-machine cycles, and the thermal modifications of the theoretical cycle in actual steam and gas engines. The object of this course is to prepare the student for courses in steam-engine design, gas engines, compressed-air refrigerating machinery, and motor cars.

Four lectures and recitations per week. Senior year.

Pre-requisites: Mathematics 10; Physics 15.

6. COMPRESSED-AIR MACHINERY

MR. RICHARDSON Winter Term, 2 credits

A study of the physical properties of air, its isothermal and adiabatic compression and expansion, single and multiple-stage compression, and the principal types of air compressors. Visits are made for the purpose of enabling the student to see the practical working of compressed air machinery.

One lecture per week. Senior year.

Pre-requisites: M. E. 3 and 5.

7. MOTOR CARS

PROFESSOR STEWART Winter Term, 2 credits

This course covers a study of the construction, operation and design of modern motor cars as follows: (1) The power-plant, including gasoline motor, carburetor, ignition system, motor cooling and lubrication. (2) The transmission, including cone and multiple-disc clutches, speed-change and reverse gears, chain, bevel-gear and worm drives, differential, semi and full-floating axles, and brakes. (3) Front axles, steering mechanism, and control. (4) Frame, springs, and body. (5) Road wheels, quick detachable and demountable wheel-rims, and tires. (6) Care of car, road-rules, and how to drive. (7) Motor-trucks.

Frequent visits are made to garages and motor-car repair shops for the purpose of studying construction details and operation.

One lecture, and either three hours of drawing or laboratory per week. Senior year.

Pre-requisites: Physics 15; Chemistry 8; M. E. 3 and 5.

8. STEAM BOILERS

PROFESSOR STEWART Winter Term, 3 credits

A study of the principal types of steam boilers, the design of the different structural details, the proportioning of a boiler of given type and horse-power, and the design of boiler accessories. Lectures on shop practice in boiler construction and visits of inspection to boiler and other plate metal shops. A study of fuels and furnaces used in the generation of steam, and of machinery for handling coal and ash.

Two lectures and three drawing hours per week. Senior year.

Pre-requisites: Physics 15; Chemistry 8; M. E. 3 and 5.

9. STEAM ENGINES

MR. RICHARDSON Winter Term, 3 credits

A study of indicator cards, entropy-temperature and crank-effort diagrams for the best known types of simple and compound engines; also the design of engine details, such as crank shafts, crank pins, connecting rods, pistons, valve gears, governors, and fly-wheels. Lectures are given on shop practice in engine construction, and visits of inspection are made to study engines in process of construction and to steam power plants to study them while in operation.

One lecture and six drawing hours per week. Senior year.

Pre-requisites: M. E. 3 and 5.

10. STEAM TURBINES

MR. RICHARDSON Spring Term, 3 credits

A study of the theory of steam turbines and of the constructive details of the types most commonly in use for the generation of power. Visits of inspection are made to local plants to study turbines in the process of construction and in operation.

Three lectures and recitations per week. Senior year.

Pre-requisites: M. E. 3 and 5.

11. GAS ENGINES AND PRODUCERS

PROFESSOR STEWART Spring Term, 3 credits

A study of modern gas engines and of the production of gas for motive power. A study is made of typical gas-engine details, after which the principal computations and drawings are made for a gas engine of given type and horse-power. Visits are made to see gas engines under process of construction and to see them operating.

Two recitations and lectures and three drawing hours per week. Senior year.

Pre-requisites: Physics 15; Chemistry 8; M. E. 3 and 5.

12. POWER-PLANT ENGINEERING

MR. RICHARDSON Spring Term, 3 credits

A study of the selection and proportioning of the essential details of a power-plant. Lectures are given on location of plant, type of power house, foundations for engines and chimneys, and visits of inspection are made to a number of representative power-plants to enable the student to study their practical operation, and, when opportunity affords, visits are made to see power-plants in process of construction.

Two lectures and three drawing hours per week. Senior year.
Pre-requisites: M. E. 8, 9, 10, and 11; E. E. 5.

13. STEAM LABORATORY

MR. RICHARDSON Winter Term, 2 credits

The testing and calibration of pressure and vacuum gauges, steam-engine indicators, planimeters, etc.; indicator and dynamometer power measurements, valve-setting, and determination of mechanical efficiency of engines; test of auxiliary apparatus, etc.

Six laboratory hours per week. Senior year.
Pre-requisites: Physics 15; M. E. 4 and 5.
Taken concurrently with M. E. 8 and 9.

14. POWER-PLANT TESTING

MR. RICHARDSON Spring Term, 1 credit

Capacity and efficiency tests of steam and gas-engine power-plants, together with complete reports on same. These tests as far as practicable will be conducted upon recently constructed power plants. The time allotted to this course, while somewhat variable, will approximate the equivalent of three laboratory hours per week. Senior year.

Pre-requisites: Physics, 15; Chemistry, 8; M. E., 4, 5, 8, and 9; Taken concurrently with M. E. 10, 11 and 12.

15. MANUFACTURE AND PROPERTIES OF IRON AND STEEL

PROFESSOR STEWART Spring Term, 3 credits

A study of (1) the Bessemer process, the theory and construction of gas producers, the open-hearth or Siemens process, and the production of steel castings; (2) the mechanical treatment of steel, including a study of the five leading types of rolling-mills, and the three processes for the manufacture of steel tubes; (3) the heat treatment of steel. Visits of inspection, on which reports are required, are made to a number of the great steel and tube mills in the vicinity of Pittsburgh.

Two lectures and either three laboratory or one afternoon inspection trip per week. Senior year.

Pre-requisites: Chemistry 8; M. E. 4; E. E. 5.

16. INSPECTION VISITS AND REPORTS

PROFESSOR STEWART AND MR. RICHARDSON 1 credit each term

Visits of inspection are made to shops, mills, factories, and power plants.

The University, being located in a vast field of industrial activity, probably the most extensive of its kind in the world, affords the student a rare opportunity for studying practical engineering in all its varied forms. After each visit the class meets with the instructor for conference and discussion. The student then prepares and submits a report, which not only provides him with a record of useful data, but also gives him an excellent exercise in technical composition.

The equivalent of one afternoon each alternate week. Senior year.

17. CURRENT ENGINEERING LITERATURE
PROFESSOR STEWART AND MR. RICHARDSON 1 credit each term

This course consists of written reviews and discussions of the current engineering literature pertaining to engineering practice.

One hour session each alternate week, together with outside readings and written reviews.

18. THESIS
PROFESSOR STEWART AND MR. RICHARDSON
Winter and Spring Terms, 3 credits each term

The subject must be chosen and presented to the head of the department for approval during the latter part of the Fall term, Senior year.

This work will generally consist of the following: (1) the preparation of a bibliography of the important literature on the subject chosen; (2) the student's own investigations and deductions; and (3) the preparation of the thesis proper.

The thesis must be delivered in its final bound form to the head of the department not later than one week before date of Commencement.

Electrical Engineering

1. DYNAMO-ELECTRIC MACHINERY
ASSISTANT PROFESSOR HARRIS Fall or Winter Terms, 5 credits

A study of the fundamental principles of electricity and magnetism and their application to direct-current machinery.

Five lectures and recitations per week. Junior year.

Pre-requisites: Physics 13.

2. APPLIED ELECTRICITY
MR. LELICH Fall or Winter Term, 3 credits

This is a short course designed to meet the requirements of those not specializing in Electrical Engineering.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

3. APPLIED ELECTRICITY
ASSISTANT PROFESSOR HARRIS Fall or Winter Term, 3 credits

This course is similar to E. E., 2; but more comprehensive in scope. Designed with special reference to the needs of Mechanical Engineering students.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

4. APPLIED ELECTRICITY
ASSISTANT PROFESSOR HARRIS — Spring or Summer Term, 3 credits

A continuation of Course E. E. 3.

Two lectures and recitations and three hours laboratory per week. Junior year.

5. APPLIED ELECTRICITY
ASSISTANT PROFESSOR HARRIS — Fall Term, 3 credits

A continuation of Course E. E. 4.

Two lectures and recitations and three hours laboratory per week. Senior year.

6. ALTERNATING-CURRENT THEORY
ASSISTANT PROFESSOR HARRIS — Spring or Summer Term, 3 credits

This course consists of a mathematical and graphical treatment of periodic functions as exemplified in alternating currents with the attendant phenomena of inductance, capacity, etc., singly and in combination.

Three lectures and recitations per week.

Pre-requisites: E. E. 1; and Mathematics 11.

7. ALTERNATING-CURRENT MACHINERY
MR. LEILICH — Fall Term, 3 credits

A mathematical and graphical treatment of alternating-current phenomena as applied to electrical machinery. A study is made of the different types of generators, motors, synchronous converters, etc.

Three lectures and recitations per week.

Pre-requisite: E. E. 6.

8. ALTERNATING-CURRENT MACHINERY
MR. LEILICH — Winter Term, 3 credits

A continuation of Course E. E. 7.

Three lectures and recitations per week. Senior year.

9. ALTERNATING-CURRENT MACHINERY
MR. LEILICH — Spring Term, 3 credits

A continuation of Course E. E. 8.

Three lectures and recitations per week. Senior year.

10. GENERAL ELECTRICAL ENGINEERING
ASSISTANT PROFESSOR HARRIS — Fall Term, 3 credits

This course is designed to cover the engineering and economic phases of the more special branches of Electrical Engineering, such as electric traction, electric transmission of power, etc.

Three lectures and recitations per week. Senior year.
Pre-requisite: E. E. 6.

11. GENERAL ELECTRICAL ENGINEERING
ASSISTANT PROFESSOR HARRIS Fall Term, 3 credits

A continuation of Course E. E. 10.
Three lectures and recitations per week. Senior year.

12. GENERAL ELECTRICAL ENGINEERING
ASSISTANT PROFESSOR HARRIS Spring Term, 3 credits

A continuation of Course E. E. 11.
Three lectures and recitations per week. Senior year.

13. ELECTRICAL ENGINEERING DESIGN
PROFESSOR KINTNER Fall Term, 4 credits

This course is intended to give the student practice in the application of the fundamental theory of electricity and magnetism to the calculation and proportioning of electrical machinery. A portion of the time is devoted to the study of the materials entering into electrical construction.

Two lectures and six hours in design room per week. Senior year.
Pre-requisite: E. E. 1.

14. ELECTRICAL ENGINEERING DESIGN
PROFESSOR KINTNER Winter Term, 4 credits

A continuation of Course E. E. 13.
Two lectures and six hours in design room per week. Senior year.

15. ELECTRICAL ENGINEERING LABORATORY
ASSISTANT PROFESSOR HARRIS Fall or Winter Term, 1 credit

This course is designed to furnish an experimental basis for the theory given in Course E. E. 1. It consists largely of elementary direct current machine tests.

Three hours laboratory per week. Junior year.
Pre-requisite: Registration in Course E. E. 1.

16. ELECTRICAL ENGINEERING LABORATORY
MR. LELICH Spring and Summer Terms, 1 credit

An experimental study of alternating current circuits, supplementing Course E. E., 6; with special reference to the effect of inductance and capacity, singly or in combinations. The measurement of alternating current single and polyphase power, and the determination and analysis of wave forms constitutes a portion of the work.

Three hours laboratory per week. Junior year.
Pre-requisite: Registration in Course E. E. 6.

17. ELECTRICAL ENGINEERING LABORATORY
MR. LEILICH Fall Term, 2 credits

Advanced direct and alternating current testing of generators, motors, transformers, converters, rectifiers, etc., both commercial and for the purpose of investigation.

Six hours laboratory per week. Senior year.

Pre-requisite: Registration in Course E. E. 7.

18. ELECTRICAL ENGINEERING LABORATORY
MR. LEILICH Winter Term, 2 credits

A continuation of Course E. E. 17.

Six hours laboratory per week. Senior year.

19. ELECTRICAL ENGINEERING LABORATORY
MR. LEILICH Spring Term, 2 credits

A continuation of Course E. E. 18.

Six hours laboratory per week. Senior year.

20. ELECTRICAL ENGINEERING SEMINAR
ASSISTANT PROFESSOR HARRIS AND MR. LEILICH
Three terms, 1 credit each term

The student and instructors meet regularly to discuss current engineering topics of interest. A part of the time is devoted to reviews and to reports and discussions of thesis matter by the Seniors.

One hour per week. Senior year.

Open to all students in Electrical Engineering.

21. INSPECTION VISITS AND REPORTS
ASSSITANT PROFESSOR HARRIS Three terms

Frequent visits of inspection are made to the numerous manufacturing establishments, both electrical and mechanical, in this vicinity. The University is unusually fortunate in being located in this great manufacturing center, where the student sees the principles which he studies in the department daily put into practical operation. Among the many large electrical establishments accessible to the technical students, especial benefit is derived from the great Westinghouse works, to which the classes are welcomed visitors at any time.

These visits of inspection are required of all Seniors in the Electrical Engineering Department.

22. ELECTRICAL ENGINEERING THESIS
5 credits

A thesis is required of all candidates for the degree of B. S. in Electrical Engineering. This will consist of a report on original investigations and is intended to demonstrate the student's ability to think and act along independent lines. The subject must be approved by the professor in charge by January 15th prior to Commencement and an outline of the results desired and method to be employed approved not later than April 1st.

PHYSICAL TRAINING

Physical training and development, until the removal of the University to its new location, was obligatory upon all members of the Freshman and Sophomore classes, subject to exception only in particular cases, such as might be so decided by the Athletic Director and an advisory committee.

The temporary suspension of work necessary on account of lack of building and equipment will be terminated on the completion of the new Trees Gymnasium, elsewhere spoken of, when definite courses will be arranged and announced.

This statement, though inserted at the end of the part of Catalog assigned to the School of Engineering in particular, has to do with undergraduate students of the University in general.

ECONOMICS

3 E. ECONOMICS

ASSISTANT PROFESSOR CRAFER Winter Term; 3 credits

A brief resumé of economic theory. Discussion of practical economic problems; wages, interest, rent, currency, banking, taxation, trusts, tariff, socialism.

Open only to Engineering and special students.

Text-book and lectures.

10, 11. TRANSPORTATION

MR. FLOCKEN Fall and Winter Terms; 2 credits each term

The origin and growth of the American railways. Their present ownership and control. The organization of the railway company, and how it does its work. Railway financiering. The freight, passenger, express and mail service. Railway abuses. Regulation by the States and by the Federal Government. The Interstate Commerce Commission. Government ownership in the light of foreign experience. Railway rates and fares. Electric railway transportation. Ocean transportation. Ocean highways and seaboard terminals. The organization of ocean freight, passenger, express and mail service. The merchant marine. The question of subsidies. The river, lake and canal systems of the United States.

The increasing importance of the inland waterways question. Text-book, lectures and assigned readings. Text-book, Johnston's *Elements of Transportation.*

13. MODERN INDUSTRIES

MR. FLOCKEN Fall Term; 2 credits

A study of the leading American industries, physiographic control, sources and supply of raw material, agricultural resources. Factors affecting the location of industry. Sources and application of power. Manufacturing methods, and factors affecting cost of production. Large scale versus small scale production. Internal commerce and foreign trade. Lectures, assigned readings and reports.

16. INDUSTRIAL MANAGEMENT

MR. FLOCKEN Winter Term; 2 credits

Advantages of various methods of business organization and management. The internal management of the large business or plant and the differentiation of the duties of various departments. Profit-sharing schemes. Labor problems. Markets and methods of distribution. A study of actual industrial conditions by visits to the mills and shops of Pittsburgh, special attention being given to the handling of raw material, the arrangement of plant, and shipping facilities. Lectures, assigned readings, reports, field work.

21. CORPORATION FINANCE

PROFESSOR HOLDSWORTH Fall Term; 2 credits

Types of business corporations. The genesis of the trust. The financial organization and management of corporations. The promoter and the underwriting syndicate. The disposition of gross earnings and the provision of new capital. Charter, articles and by-laws. Stockholders' powers, rights and liabilities. Dissolution, receiverships and reorganizations. Lectures and text-book, assigned readings and reports. Textbooks, Lough's *Corporation Finance.*

24. INVESTMENTS

PROFESSOR HOLDSWORTH Winter Term; 2 credits

The general characteristics and merits of government and municipal bonds, and of railway, industrial, public service corporation, power and irrigation securities. The farm and city mortgage. How securities are purchased and marketed. The organization of the investment business. A study of fluctuations in bond and stock prices to determine the influence acting upon security values. Analysis of typical securities and railroad reports. Examination of savings banks and trust company holdings. Lectures, assigned readings, and reports.

46. CONTRACTS AND SPECIFICATIONS

ASSISTANT PROFESSOR CRAFER — Spring Term; 3 credits

In this course are presented the essential elements of a contract, the law pertaining thereto and parties who may contract. The consideration, discharge and remedies for breach of contract. Forms of proposals, specifications and illustrative examples of complete contracts and specification for various engineering projects are given.

MATHEMATICS

2. ADVANCED ALGEBRA

DR. WENRICH AND MR. LEILICH — Fall Term, 5 hours

A course for students who have passed maximum entrance examinations, beginning at logarithms and completing the subject.

Required in all Engineering courses. Freshman year.

5. PLANE TRIGONOMETRY

DR. WENRICH AND MR. LEILICH . — Winter Term, 3 hours

The general contents of this course are the same as for Course 4, but with more emphasis upon solution of examples of all kinds, involving both theory and practical applications. Text-book, Wentworth's.

Required in all Engineering courses. Freshman year.

7, 8. ANALYTIC GEOMETRY

Winter Term, 2 credits

DR. WENRICH AND MR. LEILICH — Spring Term, 3 credits

A study of the equations and loci of right lines, conic sections and curves of higher degree; transformation of co-ordinates; analysis of the general equation of the second degree.

Required in all Engineering courses. Freshman year.

9, 10. CALCULUS

PROFESSOR FROST — Fall and Winter Terms, 4 credits each term

The formulas for differentiation are deduced both by the method of rates and that of limits and the usual practical applications are made. Integration of elementary forms is taught early in the course, and applications are made to the solution of numerous problems involving the quadrature of plane surfaces and surfaces and volumes of revolution, etc. The aim throughout the course is to give the student such working knowledge of the methods of calculus that he may apply them with confidence and facility.

Required in all Engineering courses. Sophomore year.

11. DIFFERENTIAL EQUATIONS

DR. WENRICH — Fall Term, 2 credits

Ordinary differential equations. A short course, required in Electrical Engineering. Junior Year.

PHYSICS

11, 12, 13. GENERAL PHYSICS

PROFESSOR BISHOP AND MR. MORRIS

Fall, Winter, and Spring Terms, 5 credits each term

The subjects covered in this course are the same as those in 1, 2, 3, but the calculus is extensively employed and special attention is given to the physical interpretation of mathematical equations.

A series of twelve lectures on the precision of measurements is given in connection with the laboratory work. Special attention is given in the laboratory to the method of the experiment and to the precision of the results.

Concurrent with Mathematics 8 and 10.

Required of all Engineering students. Sophomore year.

14, 15, 16. ADVANCED PHYSICAL LABORATORY

DR. WENRICH AND MR. MORRIS — Fall, Winter and Spring Terms

This course deals primarily with electrical measurements but includes experiments in measurement of high temperature, calorific power of fuels, and photometry. The experiments for each student are assigned according to the course he is pursuing.

Pre-requisite, Physics 11, 12, 13.

30, 31. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM

DR. WENRICH — Tenth and Eleventh Terms, 3 credits each term

A rigid Mathematical treatment of electricity and magnetism, including a study of Hertz's experiments and the present day theory of electro-magnetism.

Three lectures and recitations per week.

Pre-requisites, Mathematics 11.

1, 2. GENERAL INORGANIC CHEMISTRY

DR. VOGT, AND MR. —— Fall and Winter Terms, 4 credits each term

Two lectures or recitations and six laboratory hours a week. This course includes lectures and recitations upon the chemistry of the non-metals and metals. It forms an introduction to the study of chemistry and serves as a foundation for the various courses in this department. The laboratory work includes experiments in further illustration of the subject.

Required in all Engineering courses. Freshman year.

8. QUALITATIVE ANALYSIS

ASSISTANT PROFESSOR SILVERMAN AND MR. ....

Spring Term, 4 credits

This course consists of two lectures or recitations and six laboratory hours a week. The work includes the study of the reactions of bases and acids and the analysis of simple compounds and mixtures.

Pre-requisites, Courses 1, 2.

Required in all Engineering courses. Freshman year.

9, 10, 11. QUANTITATIVE ANALYSIS

ASSISTANT PROFESSOR SILVERMAN

Fall, Winter, and Spring Terms, 3 credits each term

This course consists of one lecture and six laboratory hours weekly, and includes a general study of the simpler methods of the determination of the commonly occurring elements and radicals, and also the complete analysis of various minerals.

Pre-requisite, Course 8.

Required in Chemical and Sanitary Engineering courses.

12. QUANTITATIVE ANALYSIS

ASSISTANT PROFESSOR SILVERMAN

Fall, Winter, and Spring Terms, 3 credits each term

For the completion of this course one lecture and six laboratory hours a week are required. The work includes complete analysis of minerals, ores, iron and steel, cements and alloys.

Pre-requisites, Courses 9, 10, 11.

Required in Chemical Engineering.

15. Organic Chemistry

Professor Phillips Fall, Winter, and Spring Terms, 4 credits each term

This course consists of two lectures or recitations and six hours of laboratory throughout the year. The subject is taught in an elementary way and deals with the constitution, preparation and properties of the typical compounds of the fatty and benzene series. The laboratory work includes practice in synthetical methods.

Required in Chemical Engineering.

21, 22, 23. Physical Chemistry

Dr. Vogt Fall, Winter and Spring Terms, 2 credits each term

A general course in the theories of chemistry. Pre-requisites, Courses 3-5, 15-17.

27, 28, 29. Technical Chemistry

Professor Phillips Fall, Winter, and Spring Terms, 3 credits each term

Lectures upon the chemistry of manufacturing operations, having reference especially to chemical industries in the Pittsburgh region. Visits are made to the various chemical works in the vicinity, attendance upon which is required.

Required in Chemical Engineering.

BIOLOGICAL SCIENCES

3. General Biology. Briefer Course

Professor Fettermann and Assistants Spring Term, 3 credits

This course is designed to meet the needs of engineering students who expect to take the course in Sanitary Engineering or Courses in Geology. During the first half of the course attention is given to the study of animal forms, including classification, distribution, habits, etc. The remainder of the term is given to the study of the morphology, classification and distribution of plants.

One lecture and four laboratory hours each week.

17, 18. Bacteriology

Professor Fettermann Fall and Winter Terms, 4 credits each term

This course is intended for students taking regular courses in Biology, and also those who may elect the work in Sanitary Engineering. Students are expected to become familiar with the methods of detection, isolation, and identification of various micro-organisms. Lectures are given on the classification, morphology, structure, reproduction and cultural characteristics of bacteria. Instruction is given on the principles of sterilization and disinfection, special emphasis being laid upon their practical application. In the latter part of the course special attention is given to the study of the bacteria occurring in soil, water and milk. The manner in which bacteria produce disease and the production of immunity are explained. Text-books: Jordan; Abbott; Muir and Ritchie.

One lecture and six hours laboratory each week.

19. ADVANCED BACTERIOLOGY

PROFESSOR FETTERMANN — Spring Term, 4 credits

One lecture and six hours laboratory each week.

This course is the continuation of Course 18. The object is to impart a practical knowledge of the bacteriology of water, milk and sewage. Bacteria are studied in their relation to the dairy industry, and water supply, and also with reference to the part they play in the purification of sewage.

PSYCHOLOGY

11. GENERAL PSYCHOLOGY FOR ENGINEERING STUDENTS

PROFESSOR WHITE — One Term, 2 credits

This is an introduction to the study of human nature and the psychical forces behind material progress. Emphasis will be placed upon such problems as individual differences of character and intelligence, their causes and significance; the fundamental instincts, imitation, competition, co-operation; the many social relationships, suggestion, habit, memory, constructive imagination, the emotions, reason, will, etc. Required in the Engineering courses.

GEOLOGY

GEOL. 1. GENERAL GEOLOGY
Summer Term, 5 hours, 3 credits.
GEOL. 6. STRUCTURAL AND FIELD GEOLOGY
Winter or Spring Term, 3 hours, 3 credits.

MINERALOGY

MIN. 1. CRYSTALLOGRAPHY AND MINERALOGY
Fall or Winter Term, 6 hours, 2 credits.

ASTRONOMY

The undergraduate courses in Astronomy at present given are the following; for graduate courses, see Graduate School.

1. General Astronomy

Assistant Professor Jordan — Second Semester, 2 hours

A course in Descriptive Astronomy, based upon Moulton's text-book. Required in C. E. course. Junior year.

ENGLISH LANGUAGE AND LITERATURE

1, 2, 3. Rhetoric and Composition

Mr. .... Fall, Winter and Spring Terms, each 3 credits

A study of the principles of composition, with exercises in the analysis of prose selections, practice in writing, and criticism.

Required of Freshmen.

7. Argumentation and Debating

Professor Gibbs and Mr. ...... Fall and Winter Terms, each 3 credits

The theory of argumentation, with practical exercises in brief-drawing and the composition and delivery of forensics.

Elective for students who have taken Courses 1, 2, 3, or 4, 5, 6. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15.)

15. English Literature

Professor Gibbs — Winter Term, 3 credits

A study of selected masterpieces representing the successive periods of English literature, with a text-book to furnish a historical background and connections.

Required of Sophomores. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15. For their benefit both courses will be offered in the Fall and Summer terms.)

1, 2. Public Speaking

Mr. Fish — Fall and Winter Terms, 2 credits

Exercises in the fundamentals of public address. Individual instruction in small classes.

Required of all Freshmen.

4, 5, 6. PUBLIC SPEAKING

MR. FISH Fall, Winter, and Spring Terms, each 2 credits

An advanced course in expression, both spoken and written. Students are encouraged to develop individuality and readiness in the expression of thought.

Elective for students who have taken Courses 1, 2.

GERMAN LANGUAGE AND LITERATURE

1, 2, 3. ELEMENTARY GERMAN

PROFESSOR BERGER Fall, Winter, and Spring Terms, 3 credits each term

Elements of grammar and the reading of easy texts. Vos, *Essentials of German;* Hewitt's *German Reader;* Simple lyrics and ballads memorized. Gerstaecker, *Germelhausen;* Baumbach, *Der Schwiegersohn.*

Open to Freshmen who have satisfied requirements for admission by offering French or Latin if they wish to take up German as the required modern language. Elective for Sophomores.

4, 5, 6. INTERMEDIATE COURSE

PROFESSOR BERGER Fall, Winter, and Spring Terms, 3 credits each term

Review of Grammar. Drill in translating from English into German and practice in conversation. Memorizing of simple prose and poetry. Wesselhoeft: *German Exercises.* Wenckebach: *German Composition.* Wildenburch: *Des edle Blut.* Gerstaecker: *Irrfahrten.* Hatfield: *German Lyrics and Ballads.*

Classical German Authors. Selections from the following lists of texts: Schiller: *Maria Stuart.* Gœthe: *Hermann und Dorothea;* Lessing: *Minna von Barnhelm.* German is used extensively in conducting class work.

Required of all Freshmen satisfying entrance requirements in German who elect to continue it.

7, 8, 9. TECHNICAL GERMAN

Fall, Winter, and Spring Terms, 3 credits each term

Syntax. Prose Composition, conversation. Freytag: *Soll und Haben, Aus dem Jahrhundert des grossen Krieges.* Whitefield and Kaiser: *A Course of Commercial German.*

Required of all Sophomores in Engineering courses, who elect German in Freshman year, having satisfied entrance requirements in this language. Elective for students who have taken previous courses.

ROMANCE LANGUAGES AND LITERATURES

1, 2, 3. ELEMENTARY FRENCH

PROFESSOR HARRY Fall, Winter, and Spring Terms, 3 credits each term

Grammar, composition and easy reading, with thorough drill in pronunciation and practice in speaking.

Open to Freshmen who have satisfied requirements for admission by offering German or Latin, if they wish to pursue French as the required modern language.

4, 5, 6. INTERMEDIATE FRENCH

PROFESSOR HARRY Fall, Winter, and Spring Terms, 3 credits each term

Extensive reading in selected works of Modern French writers. Fraser and Squair's Grammar completed. Advanced prose composition. French conversation. The following texts are read: Daudet, *Contes Choisis;* Maupassant, *Contes;* Coppee, *On Rend l'Argent; Augier, Le Gendre de M. Poirer;* George Sand, *La Mare au Diable;* Canfield; French Lyrics.

Required of all Freshmen satisfying entrance requirements in French who elect to continue it.

7, 8, 9. TECHNICAL FRENCH

PROFESSOR HARRY Fall, Winter, and Spring Terms, 3 credits each term

Herdler's Scientific Reader and other works of similar character will be read. The purpose of this course is to enable students to use Scientific French readily and is primarily designed for students in Engineering courses who have a good reading knowledge of ordinary French prose.

30, 31, 32. ELEMENTARY SPANISH

Fall, Winter, and Spring Terms, 3 credits each term

Hill's and Ford's Spanish Grammar, reading, composition, conversation. Bransby's Spanish Reader, Selgas, La Mariposa Blanca; Galdos, Dona Perfecta; Tamayo, Lo Positivo; Giese's Spanish Anecdotes.

35, 36, 37. COMMERCIAL SPANISH

Fall, Winter, and Spring Terms, 3 credits each term

Reading of Commercial Spanish. Commercial correspondence. Conversation. The vocabulary of every day life is emphasized.

40, 41, 42. ELEMENTARY ITALIAN

Mr. Musso Fall, Winter, and Spring Terms, 3 credits each term

Elementary grammar, dictation, reading, memorizing, conversation, and easy composition. Motti's Elementary Italian Grammar. Cattaneo, Italian Reader. DeAmicis, Cuore. Other selections from modern authors will be assigned by the instructor.

43, 44, 45. ITALIAN, INTERMEDIATE COURSE

Mr. Musso Fall, Winter, and Spring Terms, 3 credits each term

Study of Italian Grammar in Italian. Conversation and advanced prose composition. Italian literature of the XVIII and XIX centuries. Selected readings and brief lectures in Italian. Manzoni, I Promessi Sposi, will be read in full.

Open to students who have taken the course in Elementary Italian.

ALUMNI REGISTER

OF THE

SCHOOL OF ENGINEERING

OF THE UNIVERSITY OF PITTSBURGH

INTRODUCTION

This Register contains a complete list of all former students and graduates of the University who either took a degree in engineering or completed part of a course leading to such a degree. Since this is the first issued, it must of necessity contain many omissions and undoubtedly many mistakes.

The addresses and occupations have been corrected in accordance with information furnished between February 1st and May 1st, 1911.

The Dean has been assisted in the preparation of this Register by Emeritus Professor Carhart, Professors Frost, Stewart and Smith.

OPPORTUNITIES FOR APPOINTMENTS

The School of Engineering receives inquiries from time to time for men to fill positions in engineering work. These positions are often for graduates who have had a few years experience, and many times we are unable to fill them owing to the fact that we do not have the addresses of all the graduates, some of whom may wish to consider such positions.

If you employ engineers, and at any time have a demand for men of experience or for undergraduates without experience, we should be glad to have you communicate with the Dean of the School of Engineering.

ABBREVIATIONS

* Deceased.
C. E. Civil Engineer.
M. E. Mechanical Engineer.
E. E. Electrical Engineer.
Eng. Student for a time in engineering.

1846

*Morley, Isaac, C.E.
*Stilley, Edward J., C.E.

1858

*Marshall, Thomas F., C.E.

1870

Reed, James, C.E.

1873

*Hartupee, William Dilworth, M.E.

1874

Smith, William R., Eng.
*Stewart, Charles A., Eng.

1875

Neeld, Almos D., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.
Trimble, Robert, Eng., Chief Engineer Maintenance of Way, Pennsylvania Co., Union Station, Pittsburgh, Pa.

1876

Canfield, Maurice Pierpont, C.E.
McCullough, Ross, C.E.

1878

Sickman, Albert F., C.E., Hydraulic Engineer, Holyoke Water Power Co., Holyoke, Mass.

1879

Swan, Robert, C.E., Contractor, T. A. Gillespie Company, Westinghouse Bldg., Pittsburgh, Pa.
Keller, Charles, C.E., Retired. 117 Biddle Ave., Wilkinsburg, Pa.

1880

Camp, James McI., C.E., Chief Chemist, Carnegie Steel Co., Duquesne, Pa.

1883

Coffin, William C., C.E., Structural Engineer, Jones & Laughlin Co., Pittsburgh, Pa.

1884

Gray, James C., C.E.
McCabe, Junius D., C.E., 341 Fourth Ave., Pittsburgh, Pa.

1885

Bray, Harry E., C.E.
Carey, Joseph F., C.E., 4241 University Boulevard, Santiago, California.
Mesta, George, C.E., President, Mesta Machine Company, Pittsburgh, Pa.
Stewart, Reid T., C.E., Head of Department of Mechanical Engineering, University of Pittsburgh; Consulting Engineer, National Tube Co., Pittsburgh, Pa.

1886

McKean, Robert Andrews, C.E., Superintendent, Structural Dept., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Patterson, Peter C., Eng., Chief Engineer, National Tube Co., Frick Bldg., Pittsburgh, Pa.

Rosewell, Joseph T., C.E.

1887

Barbour, George Hurlburt, C.E., Asst. Chief Mechanical Engineer, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

Lyons, James K., C.E., Civil Engineer, Gas Power Engineering Corporation, Pittsburgh, Pa.

Nicholson, John H., Eng., Manufacturer, 3rd Vice-President, Shelby Steel Tube Co., Frick Bldg., Pittsburgh, Pa.

Taylor, Samuel A., C.E., Civil and Mining Engineer, 900 Lewis Bldg., Pittsburgh, Pa.

Stoner, Frank R., Eng., Attorney, 1307 Berger Bldg., Pittsburgh, Pa.

1888

Bright, Frederick, C.E., Checking Structural Drawings, Empire Bridge Co., Elmira, N. Y.

Crider, James L., C.E., Chief Engineer, New York, Westchester and Boston Ry. Co., 65 Beaver St., New York City.

Gilfillan, George A., C.E., Consulting Engineer, 341 Fourth Ave., Pittsburgh, Pa.

Jenkins, Jenks B., C.E., Asst. Engineer, Baltimore & Ohio R. R., Mt. Royal Station, Baltimore, Md.

McCormick, Roscoe, T., C.E., Manager of Sales, Petroleum Iron Works Co., Sharon, Pa.

Smith, Richard Lesnett, C.E., Consulting Engineer, Smith & Lewis, 1444-5-6 Oliver Bldg., Pittsburgh, Pa.

1889

Barrett, John Henry, C.E., Consulting Engineer, 212 Fulton Bldg., Pittsburgh, Pa.

1890

Ehlers, Charles W., C.E., Asst. Engineer, Bureau of Surveys, Pittsburgh, Pa.

*Herron, George K., C.E.

Johnston, John P., C.E., General Manager, The New York Engine Co., Watertown, New York.

Langenheim, Gustave C., C.E., 403 Times Bldg., Pittsburgh, Pa.

1891

Carhart, Charles F., C.E., Salesman, Citizens Wholesale Supply Co., Columbus, Ohio.

Hays, James W., C.E., Civil Engineer, 55 Schmidt Bldg., Pittsburgh, Pa.

Liggett, Dudley S., C.E., Real Estate & Insurance, 705 Peoples Bank Bldg., Pittsburgh, Pa.

McCabe, William P., C.E., Structural Steel Engineer, W. N. Kratzer & Co., Smallman St., Pittsburgh, Pa.

McGrew, John, C.E., John & Edward McGrew, Civil Engineers, 818 Empire Bldg., Pittsburgh, Pa.

Mollenhauer, Frederick H., C.E., Mollenhauer, Pa.

1892

Cooper, Frederick M., C.E., Coraopolis, Pa.

Davis, Charles W., M.E., Sales Manager, Standard Underground Cable Co., Pittsburgh, Pa.

Donaldson, Joseph T., C.E., Civil Engineer, Riter Conley Mfg. Co., Water St., Pittsburgh, Pa.

Emmons, Charles DeMoss, C.E., General Manager, Ft. Wayne & Wabash Valley Traction Co., Ft. Wayne, Indiana.

Hoffman, John W., Eng., Paying Teller, Pittsburgh Trust Co., Box 596, Pittsburgh, Pa.

Isenthal, Leo Ralph, C.E., Railway Constructor & Operator, Stern & Silverman, Inc., 605 Land Title Bldg., Philadelphia, Pa.

Kunkle, Charles E., C.E., Chief Draftsman, Jones & Laughlin Steel Co., Pittsburgh, Pa.

McGrew, Anson B., C.E., U. S. Asst. Engineer, United States Engineer Office, Farmers Bank Bldg., Pittsburgh, Pa.

Miles, J. Walter, C.E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Nagle, James C., C.E., Professor of Civil Engineering, A. and M. College of Texas; Consulting Engineer, College Station, Texas.

*Purdy, William G., C.E.

Rhea, Frank C., C.E.

Rose, George R., C.E., Merchant, 539 Lincoln Ave., Bellevue, Pa.

*Smith, John F., C. E.

Wittmer, George, Jr., M.E., Asst. General Manager, American Natural Gas Co., 407 Park Bldg., Pittsburgh, Pa.

Turner, Howard Q., Eng., Attorney, 317 Frick Bldg., Pittsburgh, Pa.

1893

*Bright, Paul, C.E.

Calvert, George H., C.E., Attorney, Blakeley & Calvert, Attys., Oliver Bldg., Pittsburgh Pa.

Douthitt Philip, C.E., Civil Engineer, 1347 Bluff St., Pittsburgh, Pa.

Elliott, James R., C.E., Consulting Engineer, Arlington Station, California.

Godfrey, Edward, C.E., Engineer with R. W. Hunt Co., Monongahela Bank Bldg., Pittsburgh, Pa.

*Flack, Charles A., C.E.

Howat, John B., Eng., President, Sharon Hardware Mfg. Co., Sharon, Pa.
Lauman, Walter H., C.E., 1006 Carnegie Bldg., Pittsburgh, Pa.
Noble, Howard A., Eng., Mechanical Engineer, 1417 Farmers Bank Bldg., Pittsburgh, Pa.
Sapp, Edward H., C.E., Civil Engineer, New York Shipbuilding Co., Camden, N. J.
Shaler, Edward C., C.E., Assistant Engineer, Surface Lines, Brooklyn Rapid Transit Co., 85 Clinton St., Brooklyn, N. Y.
Scott, Walter C., Eng., Engineer with National Tube Co., 554 Frick Annex, Pittsburgh, Pa.
Wylie, Thomas B., Eng., Mechanical Engineer, Equitable Water Co., Water St., Pittsburgh, Pa.
Bratt, Berton, M.E.
Ridinger, Charles W., E.E., President, Iron City Engineering Co., Grant St., Pittsburgh, Pa.

1894

Affelder, Louis J., C.E., Asst. Division Contracting Manager, American Bridge Co. of New York, Frick Bldg., Pittsburgh, Pa.
Brown, Robert C., C.E.
Clark, Milnor P., E.E., Mechanical Engineer with National Tube Co., Frick Annex, Pittsburgh, Pa.
Dammond, William H., C.E., Civil Engineer, 86 Lee's Hill St., Sneinton, Nottingham, England.
Douglass, Robert McC., C.E., 306 Fourth Ave., Pittsburgh, Pa.
Gray, Guy McC., C.E., Superintendent, Motive Power, Bessemer & Lake Erie R. R., Greenville, Pa.
Hamilton, Alfred R., Eng., Coal Trade Bulletin, Park Bldg., Pittsburgh, Pa.
Kehew, Everett E., Eng., Paying Teller, Keystone National Bank, Pittsburgh, Pa.
Neubert, Walter P., E.E., Asst. Engineer, Union Switch & Signal Co., Swissvale, Pa.
McEwen, John A., M.E., Contracting Engineer, Pittsburgh Bridge & Iron Works, Rochester, Pa.
Parkinson, David I., E.E., 323 Fourth Ave., Pittsburgh, Pa.
*Price, Jesse B., C.E.
Swan, John, Jr., Eng., 1105 Allegheny Ave., North Side, Pittsburgh, Pa.

1895

Dickey, Alfred C., C.E., Teacher of Mathematics, Shadyside Academy, Pittsburgh, Pa.
DuBarry, Dudley D., Eng., Draftsman, Jones & Laughlin Steel Co., Pittsburgh, Pa.
DuBarry, Harry F., Eng., 5816 Baum St., Pittsburgh, Pa.
Dunlap, John H., Eng., Manufacturer, John Dunlap Co., Pittsburgh, Pa.

Fawcett, Lewis R., Eng., Treasurer, Cheat Haven Coal & Coke Co., Machesney Bldg., Pittsburgh, Pa.

Gerwig, Frederick H. N., M.E., Asst. Supt., Carrie Furnaces, Carnegie Steel Co., Rankin, Pa.

Harrer, Henry, E.E., Farmer, Belgrade, Montana.

Hay, Paul Liscomb, M.E., Mechanical Engineer, Samuel Hay's Sons, 1408 Keenan Bldg., Pittsburgh, Pa.

Hoerr, Alexander L., M.E., Steam & Hydraulic Engineer, National Tube Co., McKeesport, Pa.

Hunter, Percy E., M.E., Independent Bridge Co., North Side, Pittsburgh, Pa.

Kirker, Albert H., M.E., Draftsman, U. S. Radiator Corporation, West Newton, Pa.

Moon, Charles S., Eng.

McKee, D. Gregg, E.E., Treasurer, Pittsburgh Trust Co., Fourth Ave., Pittsburgh, Pa.

Nevin, William C., Eng., 431 Fifth Ave., Pittsburgh, Pa.

Richey, Charles W., C.E., Master Carpenter, Pennsylvania R. R. Co., East Liberty Station, Pittsburgh, Pa.

Steel, Gardner, Eng.

Trees, Joseph C., C.E., President, Benedum Trees Oil Co., Unión Bank Bldg., Pittsburgh, Pa.

Wilson, Henry M., M.E., Pittsburg Representative Pittsburgh Valve Foundry & Construction Co., Pittsburgh, Pa.

1896

*Beckert, Jacob C., M.E.

Boyd, Thomas W., Eng., Architect, Boyd & Stewart, Century Bldg., Pittsburgh, Pa.

Dietz, Louis A., C.E., Engineer, Dietz Engineering Co., 50 Church St., New York.

Dunnells, Clifford G., Eng., Civil Engineer, Chas. Bickel, Architect, May Bldg., Pittsburgh, Pa.

Elverson, Howard W., Eng., General Foreman Miscellaneous Dept., Pressed Steel Car Co., Pittsburgh, Pa.

Farrar, Silas Clarke, M.E., Mechanical Engineer, Bureau of Water, 532 Oliver Bldg., Pittsburgh, Pa.

Francies, William H., C.E., Asst. Superintendent, County Roads, Court House, Pittsburgh, Pa.

Glaubitz, Hugo, C.E.

Harlow, James Hayward, C.E., Civil Engineer, Susquehanna Power Co., Darlington, Md.

Horner, Joseph T., E.E., 910 Sherman Ave., N. S., Pittsburgh, Pa.

House, Edward B., Eng., Professor of Civil and Irrigation Eng., Colorado Agricultural College, Ft. Collins, Colorado.

Hunter, H. M. H., M.E., Salesman, Carnegie Steel Co., Cincinnati, Ohio.
Jack, Wilbur Lee, Eng., 55 Water St., Pittsburgh, Pa.
McCullough, Harvey V., C.E., W. T. McCullough Electric Co., 2315 Penn Ave., Pittsburgh, Pa.
McMasters, Robert T., C.E., Inspecting Engineer, Pittsburgh & Lake Erie R. R., Pittsburgh, Pa.
Neeld, Charles M., C.E., Manager, McClintic Marshall Construction Co., Pittsburgh, Pa.
Neely, Wm. R., M.E., Secretary, Best Mfg. Co., Pittsburgh, Pa.
Porter, James C., Eng.
Rust, Frank, Jr., Eng., 1341 Kentucky Ave., Pittsburgh, Pa.
Spencer, Stewart C., Eng., Horticulturist, Ocean Springs, Mississippi.
Strassburger, Dan S., C.E., Merchant, Atlantic Glass Co., 225 Water St., Pittsburgh, Pa.
Tanner, J. Roy, Eng., Asst. General Manager, Pittsburgh Valve Foundry & Construction Co., Pittsburgh, Pa.
Wittmer, Thomas, Eng., Civil Engineer, American Natural Gas Co., Park Bldg., Pittsburgh, Pa.

1897

Bennett, Edward, E.E., Professor of Electrical Engineering, University of Wisconsin, Madison, Wis.
Biggs, George W., Jr., C.E., 714 East End Ave., Pittsburgh, Pa.
Bradshaw, William M., E.E., 400 Whitney Ave., Wilkinsburg, Pa.
Bright, Graham, E.E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Davis, Alfred C., E.E., Superintendent, American Mfg. Concern, Falconer, New York.
Dornbush, Charles C., C.E., Designer & Estimator, Jones & Laughlin Co., Pittsburgh, Pa.
Francies, Edward S., C.E., Jones & Laughlin Steel Co., Pittsburgh, Pa.
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1898

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1899

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1900

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Zimmerman, Chas., W., Eng.

1901

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DesIslets, John C., Eng., Pressed Steel Car Co., Broad St., New York.

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Miller, John A. W., M.E., Asst. Superintendent, Gas Department, Pittsburgh Plate Glass Co., Ford City, Pa.

Mitchell, Wm. H., M.E., Inspector, The Niagara Falls Power Co., Bethlehem Steel Co., South Bethlehem, Pa.

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1902

Brinker, Wm. E., Eng., Real Estate, Colonial Bldg., Wilkinsburg, Pa.
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1903

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1904

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Dawson, Wm. E., C.E.

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1905

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Henrici, Frederick Wm., C.E., Draftsman, American Bridge Co., Ambridge, Pa.

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1906

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1907

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1909

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McGurn, Jerome S., E.E.
McIntyre, Elmer L., C.E., Draftsman, Shiffler Plant, American Bridge Co., 48th St., Pittsburgh, Pa.
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Risacher, Joseph L., M.E.

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1910

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Name	Degree	Class
Adams, Frank N.	M.E.	1906
Affelder, Louis J.	C.E.	1894
Ambrose, Frederic B.	E.E.	1907
Angle, Philip E.	M.E.	1908
Barbour, George H.	C.E.	1887
Barr, J. Toner	Eng.	1901
Barrett, John H.	C.E.	1889
Bates, H. H.	C.E.	1908
Bauer, George F.	C.E.	1900
Blackburn, Harry A.	C.E.	1908
Blackadore, John	C.E.	1900
Bradshaw, Wm. M.	E.E.	1897
Bratt, Berton	M.E.	1893
Bray, Harry E.	C.E.	1885
*Beckert, Jacob C.	M.E.	1896
Bender, Allen P.	E.E.	1906
Benner, Jacob W.	M.E.	1901
Bennett, Edward	E.E.	1897
Biggert, Florence C.	M.E.	1899
Biggs, George W., Jr.	C.E.	1897
Brinker, Wm. E.	Eng.	1902
Bright, Frederick	C.E.	1888
Bright, Graham	E.E.	1897
*Bright, Paul	C.E.	1893
Boddie, Clarence A.	E.E.	1908
Boland, Jerome A.	C.E.	1909
Bole, Thomas M.	C.E.	1907
Boothe, Willis	C.E.	1903
Brown, Robert C.	C.E.	1894
Brown, Thomas H.	C.E.	1903
Boyd, Thomas W.	Eng.	1896
Butz, Harry A.	E.E.	1898
Brunner, Elmer H.	Eng.	1906
Byers, Orah M.	E.E.	1904

Name	Degree	Class
Calvert, George H.	C.E.	1893
Canfield, Maurice P.	C.E.	1876
Cannon, Edgar C.	C.E.	1909
Camp, James McI.	C.E.	1880
Campbell, John T.	C.E.	1910
Carey, Joseph F.	C.E.	1885
Carhart, Charles F.	C.E.	1891
Carhart, Thomas C.	C.E.	1907
Chalfant, Frederick B.	C.E.	1902
Clark, Milnor P.	E.E.	1894
Craig, Paul S.	C.E.	1904
Crampton, B. P.	E.E.	1904
Crea, Thomas C.	C.E.	1905
Creelman, Leonidas J.	C.E.	1907
Crider, James L.	C.E.	1888
Coates, Edward S.	E.E.	1900
Cochran, Charles L.	C.E.	1898
Coffin, William C.	C.E.	1883
Collins, Frank S.	M.E.	1900
Collins, Palmer	M.E.	1899
Cooper, Frederick M.	C.E.	1892
Cooper, Walter S.	C.E.	1904
Cooper, William M.	M.E.	1907
Cullers, William H.	C.E.	1901
Currl, Harry M.	Eng.	1901
Curry, Grant	M.E.	1908
Crum, Frank M.	C.E.	1910
Dambach, Wm. N. D.	C.E.	1905
Dammond, Wm. Hunter	C.E.	1894
Daugherty, Rush L.	E.E.	1906
Davis, Alfred C.	E.E.	1897
Davis, Charles W.	M.E.	1892
Davis, Karl E.	C.E.	1910
Davis, Roland	E.E.	1905
Dawson, Wm. E.	C.E.	1904
Decker, James G.	C.E.	1909
Desch, John L.	C.E.	1908
DesIslets, John C.	Eng.	1901
DeVore, Henry C.	M.E.	1898
Drexler, Louis A.	Eng.	1898
Dickey, Alfred C.	C.E.	1895
Dietz, Louis A.	C.E.	1896
Dinger, Layard E.	C.E.	1907

Name	Degree	Class
Dodds, Samuel R.	E.E.	1903
Donaldson, Harry C.	Eng.	1900
Dornbush, Charles C.	C.E.	1897
Dornbush, George A.	C.E.	1904
Dougherty, Lemuel H.	C.E.	1902
Douglass, Robert McC.	C.E.	1894
Douglass, Thomas L.	C.E.	1907
Douthitt, Philip	C.E.	1893
DuBarry, Dudley D.	Eng.	1895
DuBarry, Harry F.	Eng.	1895
Duff, John M.	M.E.	1905
Dunlap, John H.	Eng.	1895
Dunnells, Clifford G.	Eng.	1896
Dygert, Warren B.	C.E.	1910
Earl, Howard A.	C.E.	1901
Edgar, William C.	C.E.	1908
Edwards, Edward T.	M.E.	1903
Eisenbeis, Walter H.	E.E.	1902
Ehlers, Charles W.	C.E.	1890
Ehrman, Sidney	C.E.	1904
Elliott, James R.	C.E.	1893
Elliott, Welday S.	M.E.	1907
Elverson, Howard W.	Eng.	1896
Ellwood, Orville A.	M.E.	1904
Emmons, Charles DeM.	C.E.	1892
*Eshelman, R. D.	C.E.	1908
Farmer, James McD.	Eng.	1902
Farrar, Silas C.	M.E.	1896
Farris, John	C.E.	1909
Fawcett, Lewis R.	Eng.	1895
*Flack, Charles M.	C.E.	1893
Francies, Edward S.	C.E.	1897
Francies, Wm. H.	C.E.	1896
Frazier, Albert	C.E.	1910
Ferree, Eugene C.	E.E.	1910
Filson, George C.	C.E.	1904
Finley, William P.	C.E.	1905
Fisher, Wm. Clifford	C.E.	1907
Fisher, Chester G.	M.E.	1900
Fitzharris, Frederick T.	C.E.	1903
Fullerton, Hugh L.	E.E.	1902

Name	Degree	Class
Ganter, Carl F.	Eng.	1906
Glaubitz, Hugo	C.E.	1896
Gray, Arthur E.	M.E.	1899
Gray, Guy McC.	C.E.	1894
Gray, James C.	C.E.	1884
Gerber, Christian G.	C.E.	1900
Gerwig, Frederick H. N.	M.E.	1895
Gilfillan, George E.	C.E.	1888
*Gibson, William N.	C.E.	1902
Godfrey, Edward	C.E.	1893
Goehring, Charles P.	C.E.	1900
Goldie, William, Jr.	M.E.	1898
Gormley, Frank N.	C.E.	1904
Guenther, Emil B.	M.E.	1903
Glueck, Robert J.	E.E.	1907
Hamilton, Alfred R.	Eng.	1894
Hammer, Howard G.	Eng.	1900
Handleman, Morris	C.E.	1906
Hanna, Roscoe E.	Eng.	1899
Harlan, Clarence H.	C.E.	1906
Harley, John D.	M.E.	1908
Harlow, James Hayward	C.E.	1896
Harrer, Henry	E.E.	1895
Hartman, Charles M.	M.E.	1907
*Hartupee, Wm. Dilworth	M.E.	1873
Hansen, William K. W.	M.E.	1901
Hay, Paul Liscomb	ME..	1895
Hays, James W.	C.E.	1891
Haynes, Harold A.	E.E.	1910
Henrici, Frederick Wm.	C.E.	1905
Herr, Andrew G.	Eng.	1901
*Herron, George K.	C.E.	1890
Hillman, John J., Jr.	Eng.	1901
Hindman, William S.	C.E.	1898
Hockensmith, Wilbur D.	M.E.	1901
Hoer, Alexander L.	M.E.	1895
Hoffman, John W.	Eng.	1892
Hogg, David M.	M.E.	1903
Hoopes, Henry T.	E.E.	1897
Horne, George H.	E.E.	1907
Horner, Joseph T.	E.E.	1896
House, Edward B.	Eng.	1896
Howatt, John B.	Eng.	1893

Name	Degree	Class
Hunter, Harry M. H.	M.E.	1896
Hunter, Percy E.	M.E.	1895
Hunter, Samuel K.	C.E.	1900
Hurst, Olver C.	M.E.	1898
Inglefield, Charles L.	E.E.	1908
Irwin, Lee S.	Eng.	1899
Isenthal, Leo Ralph	C.E.	1892
Jack, Wilbur Lee	Eng.	1896
Jamison, Richard H.	C.E.	1908
Jenkins, Jenks B.	C.E.	1888
Johnson, Frank E.	Eng.	1901
Johnston, Edward VanD.	M.E.	1897
Johnston, John P.	C.E.	1890
Jones, Archibald R.	C.E.	1905
Jones, B. Lester	M.E.	1904
Junkin, Hays MacLean	M.E.	1904
Kanhofer, Walter G.	C.E.	1908
Kramer, Frank P.	M.E.	1905
Kehew, Everette E.	Eng.	1894
Keller, Charles	C.E.	1879
Kelly, Henry E.	E.E.	1898
Keenan, Albert W.	C.E.	1908
Kunkle, Charles E.	C.E.	1892
Kier, Samuel M.	E.E.	1897
Kincaid, Charles W.	E.E.	1910
Kirker, Albert H.	M.E.	1895
Kiser, Alexander B.	E.E.	1897
Kissinger, George B.	C.E.	1908
Knight, Walter S.	M.E.	1905
Knopf, Julius R.	M.E.	1901
Knotts, William W.	M.E.	1910
Lambie, Charles S.	C.E.	1900
Lambie, Joseph Sioussa	C.E.	1907
Langenheim, Gustave G.	C.E.	1890
Lauman, Walter H.	C.E.	1893
Layng, Frank R.	Eng.	1900
Libbey, James T.	C.E.	1904
Liggett, Dudley S.	C.E.	1891
Liggett, Sidney S.	Eng.	1897
Linn, Guy F.	M.E.	1902

Name	Degree	Class
Long, Frederick A.	C.E.	1909
Lyons, James K.	C.E.	1887
Machesney, Harold B.	Eng.	1903
Magaw, Harry D.	M.E.	1908
Martin, James R. McI.	E.E.	1909
Marsh, Howard G.	M.E.	1906
*Marshall, Thomas F.	C.E.	1858
Maxwell, Robert G.	C.E.	1905
McCandless, William J.	C.E.	1909
McCabe, Junius D.	C.E.	1884
McCabe, William P.	C.E.	1891
McConnell, Malcolm F.	M.E.	1902
McClelland, Robert T.	C.E.	1906
McCullough, Harvey V.	C.E.	1896
McCullough, Ross	C.E.	1876
McCormick, Roscoe T.	C.E.	1888
McCutcheon, Norman D.	C.E.	1903
McElhinney, John H.	M.E.	1909
McEwan, John A.	M.E.	1894
McFarland, Joseph C.	C.E.	1905
McFeeters, Guy S.	C.E.	1909
McGrew, Anson B.	C.E.	1892
McGrew, John	C.E.	1891
McGurn, Jerome S.	E.E.	1909
McHenry, Thomas	C.E.	1904
McIntyre, Elmer L.	C.E.	1909
McIntyre, John N.	C.E.	1905
McKee, Edwin B.	M.E.	1908
McKee, D. Gregg	E.E.	1895
McKean, Robert A.	C.E.	1886
McKenna, Roy C.	E.E.	1904
McKirdy, Charles W.	M.E.	1904
McMasters, Robert T.	C.E.	1896
Mesta, George	C.E.	1885
Miles, J. Walter	C.E.	1892
Miller, Frank F.	M.E.	1901
Miller, John A. W.	M.E.	1901
*Miller, Ralph R.	C.E.	1899
Millar, William E.	C.E.	1910
Mitchell, Lindsay LaC.	E.E.	1907
Mitchell, William H.	M.E.	1901
Mitchell, Wayne S.	E.E.	1906

Name	Degree	Class
Mollenhauer, Frederick H.	C.E.	1891
Moody, Wm. Falley	Eng.	1901
Moon, Charles S.	Eng.	1895
Morganstern, Ralph M.	E.E.	1897
*Morley, Isaac	C.E.	1846
Mould, Edmund F.	Eng.	1899
Mueller, Robert G.	M.E.	1910
Mueller, William F.	M.E.	1910
Mulheim, Charles B.	M.E.	1906
Munroe, Charles L.	Eng.	1900
Murdock, William H.	Eng.	1901
Murry, John S.	C.E.	1899
*Murray, William M.	C.E.	1908
Nagle, James C.	C.E.	1892
Neeld, Almos D.	C.E.	1875
Neeld, Almos D. Jr.	C.E.	1909
Neeld, Charles M.	C.E.	1896
Neeld, Robert E.	C.E.	1910
Neely, William R.	M.E.	1896
Neubert, Walter P.	E.E.	1894
Nevin, William C.	Eng.	1895
Nicholson, John H.	Eng.	1887
Noble, Howard A.	Eng.	1893
O'Hagan, Charles F.	C.E.	1900
Orr, Almer H.	Eng.	1900
Page, Illtid A	M.E.	1904
Palmer, George B.	Eng.	1899
Parkinson, David I.	E.E.	1894
Parr, William P.	E.E.	1909
Partington, Joshua A.	M.E.	1905
Patterson, Peter C.	Eng.	1885
Paul, Earl W.	E.E.	1901
Pennington, Harley	M.E.	1899
Peterson, Albert A.	Eng.	1899
Plecker, May Bert	C.E.	1897
Piper, Theodore J.	C.E.	1907
Price, Edward K.	E.E.	1906
Price, David R.	E.E.	1908
*Price, Jesse B.	C.E.	1894

Name	Degree	Class
Price, Philip W.	C.E.	1899
Porter, James C.	Eng.	1896
*Purdy, William G.	C.E.	1892
Rall, Robert O.	M.E.	1905
Ramsey, Frank R.	C.E.	1902
Rankin, Harry H.	C.E.	1897
Ransom, George W.	E.E.	1901
Reed, James	C.E.	1870
Reid, Samuel	C.E.	1899
Reineman, Walter G.	C.E.	1905
Reizenstein, Harry S.	E.E.	1910
Rhea, Frank C.	C.E.	1892
Renton, Thomas E. Jr.	M.E.	1909
Renton, Walter C.	M.E.	1909
Reuter, William C.	M.E.	1906
Richey, Charles W.	C.E.	1895
Richards, Robert W.	M.E.	1910
Ridinger, Charles W.	E.E.	1893
Riley, Albert D.	M.E.	1898
Risacher, Joseph L.	M.E.	1909
Roberts, Elijah R.	E.E.	1899
Roessing, Frank M.	E.E.	1900
Roessing, Lawrence W.	C.E.	1909
Rogaliner, Morris L.	C.E.	1899
Rogaliner, Wm. L.	M.E.	1905
Rosewell, Joseph T.	C.E.	1886
Rosser, Charles M.	E.E.	1904
Routh, Charles M.	M.E.	1908
Roberts, James M.	C.E.	1910
Rudolph, Clyde A.	E.E.	1909
*Russell, John W.	E.E.	1899
Rust, Frank Jr.	Eng.	1896
Salkeld, Roy C.	C.E.	1908
Sapp, Edward H.	C.E.	1893
Schaeffer, James G.	M.E.	1905
Schaeffer, Ralph G.	C.E.	1906
Shanor, Edgar E.	M.E.	1904
Slaymaker, Philip K.	M.E.	1898
Stackhouse, Raymond C.	E.E.	1907
Strassburger, Daniel S.	C.E.	1896

Name	Degree	Class
Swan, John, Jr.	Eng.	1894
Swan, Robert	C.E.	1879
Schreiber, John W.	M.E.	1907
Schweppe, Raymond	E.E.	1907
Shaler, Elward C.	C.E.	1893
Sherbon, George E.	C.E.	1908
Spencer, Stewart C.	Eng.	1896
Sperling, George E.	C.E.	1898
Steel, Gardner,	Eng.	1895
Stein, Adam Jr.	E.E.	1903
*Stewart, Charles A.	Eng.	1874
Stewart, Reid T.	C.E.	1885
Sickman, Albert F.	C.E.	1878
Silliman, Guy F.	C.E.	1906
Shriver, Karl H.	C.E.	1908
*Smith, John F.	C.E.	1892
Smith, J. Hammond	E.E.	1898
Smith, Richard Lesnett	C.E.	1888
Smith, Wm. Acheson	C.E.	1900
Smith, William R.	Eng.	1874
Smith, Kosciusko McC.	E.E.	1908
*Stilley, Edward J.	C.E.	1846
Scott, Walter C.	Eng.	1893
Shrom, William G.	M.E.	1897
Stoner, Frank R.	Eng.	1887
Sulzner, George T.	Eng.	1902
Supplee, Charles W.	C.E.	1909
Stuebner, Ruben	C.E.	1905
Tanner, J. Roy	Eng.	1896
Taylor, Allan R.	C.E.	1910
Taylor, Charles E.	C.E.	1904
Taylor, Ernest S.	C.E.	1906
Taylor, John L.	C.E.	1898
Taylor, Samuel A.	C.E.	1887
Terbush, Clifford C.	C.E.	1907
Thomas, Bennett T.	C.E.	1909
Thomas, Edwin L.	Eng.	1899
Thomson, Robert W.	E.E.	1907
Todd, George C.	C.E.	1903
Trees, Joseph Clifton	C.E.	1895
Trimble, Alexander F.	C.E.	1897

Name	Degree	Class
Trimble, Robert	Eng.	1875
Truxall, Edward L.	M.E.	1906
Turner, George F.	C.E.	1903
Turner, Charles A.	E.E.	1908
Turner, Howard Q.	Eng.	1892
Vandivort, Samuel E.	C.E.	1908
Voelker, Aloys	C.E.	1910
Waggoner, Charles W.	C.E.	1903
Wagner, Gustave E. T.	M.E.	1904
Wahr, Harry F.	M.E.	1903
Wallace, Frederick J.	M.E.	1909
Wallace, Richard W.	E.E.	1902
Ward, Chas. A.	M.E.	1909
Warne, Charles C.	M.E.	1903
Watt, Herman E.	M.E.	1901
Weber, John, Jr.	M.E.	1909
Weldin, William A.	C.E.	1902
Weldin, Walter J.	C.E.	1906
Weeks, Alfred B.	Eng.	1904
Werner, Edward H.	M.E.	1906
Wetzel, Walter C.	E.E.	1907
Wilde, Herbert K.	C.E.	1897
Wiley, James G.	C.E.	1902
Willock, Roy Leech	M.E.	1909
Willock, Sylvester R.	M.E.	1905
Wilson, Albert John E., Jr.	C.E.	1906
Wilson, Henry M.	M.E.	1895
Wittmer, George, Jr.	M.E.	1892
Wittmer, Thomas	Eng.	1896
Woodson, Howard D.	C.E.	1899
Wooldridge, Charles L.	Eng.	1897
Worcester, Winthrop S.	Eng.	1897
Wuth, Wm. B.	Eng.	1899
Wylie, Thomas B.	Eng.	1893
Wynne, Arthur V.	Eng.	1910
Wynne, Clarence B.	C.E.	1906
Whyte, Robert	M.E.	1906
Young, Roy A.	C.E.	1910
Zimmerman, Charles W.	Eng.	1900

DEAN'S OFFICE

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1912/13

VOL. 8 MARCH, 15, 1912 No. 6

University of Pittsburgh

BULLETIN

ANNOUNCEMENT OF THE

SCHOOL OF ENGINEERING

FOR

1912 - 1913

AND

ALUMNI REGISTER

OF THE
SCHOOL OF ENGINEERING

1908

Entered June 4, 1910 at the Post Office at Pittsburgh, Pa., as second class matter under the act of Congress of July 16, 1894

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SCHOOL OF ENGINEERING

CALENDAR

1912

January 2	Tuesday—Winter Term, twelve weeks begins. Work resumed in all Schools.
February 22	Thursday—Washington's Birthday, a holiday, all Schools.
February 27-28-29	Tuesday-Thursday—Charter Day. One hundred twenty-fifth Anniversary Exercises.
March 11	Monday—Spring Meeting. Board of Trustees.
March 23	Saturday—Winter Term ends.
March 25	Monday—Spring vacation of one week begins.
April 1	Monday—Spring Term of eleven weeks, begins.
April 5	Friday—Good Friday, a holiday.
May 30	Thursday—Decoration Day, a holiday.
June 10	Monday—Annual Meeting, Board of Trustees.
June 13-15	Thursday to Saturday—Examinations for admission.
June 15	Saturday—Spring Term ends.
June 16	Sunday—Baccalaureate Sermon.
June 19	Wednesday—Commencement.

1912-1913

June 24	Monday—Summer Term of ten weeks begins.
August 31	Saturday—Summer Term ends.
September 26-28	Thursday to Saturday—Examinations for admission, College, Schools of Education, Economics, Engineering, and of Mines. Registration of new students in same Schools.
September 30	Monday—Work begins.
October 14	Monday—Fall meeting, Board of Trustees.
November 28-30	Thanksgiving recess.
December 9	Monday—Winter Meeting, Board of Trustees.
December 21	Saturday—Fall Term closes.
December 23	Monday—Vacation of two weeks begins.

1913

January 6	Monday—Winter Term, twelve weeks, begins. Work resumed in all schools.
February 22	Saturday—Washington's Birthday, a holiday. Schools.
February 28	Friday—Charter Day.

March 10	Monday—Spring Meeting, Board of Trustees.
March 21	Friday—Good Friday, a holiday.
March 29	Saturday—Winter Term ends.
March 31	Monday—Spring vacation of one week begins.
April 7	Monday—Spring Term of eleven weeks begins.
May 30	Friday—Decoration Day, a holiday.
June 8	Monday—Annual Meeting, Board of Trustees.
June 21	Saturday—Spring Term ends.
June 22	Sunday—Baccalaureate Sermon.
June 25	Wednesday—Commencement, all Schools.
June 26-28	Thursday to Saturday—Examinations for admission.
June 30	Monday—Summer Term of ten weeks begins.

OFFICES AND OFFICE HOURS

CHANCELLOR McCORMICK, 106 State.
Secretary Linhart, 107 State.
Registrar Frost, 108 State.
Dean Bishop, 101 Thaw.
Professor Phillips, 303 Thaw.
Professor Stewart, 109 Thaw.
Professor Smith, 202 Thaw.
Professor Duncan, 1 Chemical Bldg.
Professor Lincoln, 207 Thaw.
Professor Knowles, 406 Thaw.
Asst. Prof. Harris, 207 Thaw.
Asst. Prof. Richardson, 109 Thaw.
Mr. Bankson, 203 Thaw.
Mr. Lambie, 406 Thaw.
Mr. Weber, 7 Thaw.

The Dean's Office 101 Thaw Hall, School of Engineering Building is open from 8:30 A. M. to 5:30 P. M. Telephone 2500 Schenley.

General office, State Hall, Grant Boulevard, Telephone 2500 Schenley.

For catalogue and other information, address the Secretary of the University, Grant Boulevard, Pittsburgh, Pa.

MEMBERS OF FACULTY AND TEACHING STAFF

Samuel Black McCormick, D.D., LL.D., Chancellor.

Albert Ellis Frost, A.M., Sc.D., Registrar.

Frederic Lendall Bishop, Ph.D., Dean, Professor of Physics.

Daniel Carhart, M.C.E., Sc.D., Emeritus Professor of Civil Engineering.

Francis Clifford Phillips, Ph.D., Professor of Chemistry.

Reid Thomas Stewart, Ph.M., C.E., Professor, and Head of Department of Mechanical Engineering.

John Hammond Smith, E.E., Professor, and Head of Department of Civil Engineering.

Robert Kennedy Duncan, A.B., Professor of Industrial Chemistry and Head of Department of Chemical Engineering.

Paul Martyn Lincoln, M.E., Professor, and Head of Department of Electrical Engineering.

Morris Knowles, B.S., C.E., Director, Department of Sanitary Engineering.

David Francis Crawford, Director, Department of Mechanical Railway Engineering.

Clarence Livingstone Speyers, Ph.D., Professor of Thermodynamics.

Leslie Huntington Harris, B.S., in E.E., Assistant Professor of Electrical Engineering.

Iden Foster Richardson, B.S. in M.E., Assistant Professor of Mechanical Engineering.

Ellis Edwin Bankson, B.S. in C.E., Instructor in Civil Engineering.

Joseph Sioussa Lambie, C.E., Instructor in Civil and Sanitary Engineering.

John Weber, M.E., Instructor in Practical Mechanics.

Frank Thurman Leilich, E.E., M.S., Instructor in Electrical Engineering.

Charles Thompson, Assistant in Practical Mechanics.

William James Heatley, Assistant in Practical Mechanics.

Members of Faculty and Teaching Staff of Other Schools Giving Instruction in the School of Engineering

John Colvin Fettermann, Ph. B., Ph.M., Professor of Biology.

Ferdinand Berger, A.M., Professor of the German Language and Literature.

Marshman Edward Wadsworth, A.M., Ph.D., Professor of Geology.

Jesse Hayes White, A.M., Ph.D., Professor of Psychology.

Lincoln Robinson Gibbs, A.M., Professor of English.

Henry Adolph Kohman, Ph.D., Professor of Organic Chemistry.

Alexander Silverman, A.B., M.S., Assistant Professor of Chemistry.

Frank Craig Jordan, A.M., Assistant Professor of Astronomy.

Philip Warner Harry, A.M., Ph.D., Assistant Professor of Romance Languages.

Clarence Charles Vogt, A.M., Ph.D., Assistant Professor of Inorganic and Physical Chemistry.

Calvin Naftzinger Wenrich, A.B., A.M., Ph.D., Assistant Professor of Physics, and Acting Head of the Department of Mathematics.

Charles Hoffman, B.S., Assistant Professor of Organic Chemistry.

Lester Albert Pratt, M.S., Assistant Professor of Qualitative Analysis.

Samuel Ray Scholes, Ph.D., Assistant Professor of Industrial Chemistry.

Robert Rex Shively, B.S., Assistant Professor of Quantitative Analysis.

Thomas W. B. Crafer, Ph.D., Assistant Professor of Sociology.

Andrew Bennett Wallgren, M.D., Instructor in Zoology.

Harry Nelson Eaton, A.B., A.M., Instructor in Geology and Petrography.

Salvatore Musso, Theological Seminary, Rome. Instructor in Romance Languages.

Orrion Wilson Albert, A.B., M.S., Instructor in Mathematics and Physics.

Lawrence Wylie Burdick, Ph.B., A.M., Ph.D., Instructor in Latin and German.

Frank Byron Crandall, M.A., Instructor in Romance Languages.

Howard Edward Dyche, M.E., E.E., Instructor in Mathematics.

Martin Clement Hoffman, A.B., Instructor in English.

John Kemerer Miller, A.B., Instructor in English.

CO-OPERATIVE PLAN OF ENGINEERING INSTRUCTION

The work in the School of Engineering is carried on under the co-operative plan. This means that the student, during his course, works four terms of three months each in some of the engineering industries of the Pittsburgh district, and receives the same amount of theoretical training as he would in any engineering school, in addition.

The work is conducted under actual commercial conditions. Thoroughly practical knowledge can be had only by actual work in the engineering industries and should be required as early as possible. Working side by side with other employees, students get an insight into labor conditions. Detailed observation of engineering work and the conduct of business, from the productive point of view, gained in the students formative years, is an invaluable addition to the knowledge gained from text-books and instructors.

Although the University has made special arrangements with local industrial concerns and will co-operate with these concerns, in all possible ways, for the benefit of its engineering students, students are regarded as direct employees of the concerns. They serve for six working days each week, receive pay, are required to observe the regulations of the company, and are subject to existing labor conditions and laws, including those pertaining to liability for accident.

This industrial practice is arranged, so far as feasible, to provide every student with an opportunity of working in the branch of engineering in which he is especially interested. It is also arranged that a part of the students shall be in school and a part in practical work at the same time, interchanging in such a manner that continuous service is furnished to the manufacturer.

Each student reports to the proper instructor one evening of each alternate week, for a discussion of his practical work; at the end of the term, on presentation of a written report of his work and observations, he receives twenty credits.

FIRMS CO-OPERATING WITH THE SCHOOL OF ENGINEERING

Aluminum Company of America, Pittsburgh, Pa.
Borough of Sewickley, Sewickley, Pa.
Douglass & McKnight, Civil Engineers, Pittsburgh, Pa.
Duquesne Steel Works, Duquesne, Pa.
Evan Jones Co., Contractors, Pittsburgh, Pa.
Farris Bridge Co., Pittsburgh, Pa.
Lewis Foundry & Machine Co.

Mesta Machine Co., West Homestead, Pa.
McClintic-Marshall Construction Co., Pittsburgh, Pa.
National Tube Co., McKeesport, Pa.
Pennsylvania R. R., Pittsburgh, Pa.
Pennsylvania State Highway Department.
Pennsylvania R. R. Shops, Altoona, Pa.
Pittsburgh Plate Glass Co., Ford City, Pa.
H. K. Porter Co., Pittsburgh, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
F. G. Ross, Engineer, Pittsburgh, Pa.
Trussed Steel Concrete Co., Pittsburgh, Pa.
Union Switch & Signal Co., Pittsburgh, Pa.
Westinghouse Machine Co., East Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Pittsburgh Transformer Co., N. S., Pittsburgh, Pa.
Department of Health, Pittsburgh, Pa.

VISITS OF INSPECTION

To take advantage of the opportunities offered by the Pittsburgh district, in every way possible, there has been organized a series of visits of inspection to the different manufacturing plants. These begin in the Freshman year when the visits are made in connection with Chemistry and Elementary Mechanical Laboratory, and extend throughout the entire course. During the Junior and Senior years, they are made in connection with the special work of the different departments.

All visits of inspection are preceded by a half-hour descriptive lecture by the instructor. Reports are required from each student on each visit. The following is a partial list of the plants and engineering work visited during the year 1911-1912:

American Bridge Company, Ambridge, Pa.
Cambria Steel Co., Johnstown, Pa.
County Work House—Sewage Disposal Plant, Claremont, Pa.
Duquesne Steel Works, Duquesne, Pa.
Hamilton Glass Works, Pittsburgh, Pa.
H. J. Heinz Bottle Works, Pittsburgh, Pa.
Hubbard & Company, Manufacturers, Pittsburgh, Pa.
Mesta Machine Co., West Homestead, Pa.
Oil Well Supply Company, Pittsburgh, Pa.
P. & L. E. Shops, Pittsburgh, Pa.
Pennsylvania R. R. test plant, Altoona, Pa.
Pennsylvania Water Co., Wilkinsburg Filter.
Pittsburgh Filtration Plant.
Spang Chalfant Co., Etna, Pa.

United Engineering & Fdy. Co., Pittsburgh, Pa.
Union Steel Casting Co., Pittsburgh, Pa.
Union Switch & Signal Co., Swissvale, Pa.
Westinghouse Foundry Co., East Pittsburgh, Pa.
Westinghouse Machine Co., East Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUSEUMS AND LABORATORIES

1. The Smith Cabinet. This collection was formed by the two sisters whose name it bears, and is rich in beautiful mineralogical and zoölogical specimens. Especially is it noteworthy for the size and beauty of the objects from the mineral kingdom, already in place, and every year valuable additions are made, through the generosity and personal attention of the founders, of the same exceptional excellence as those with which the collection was begun, thus making it of increasing value as an exhibit as well as a basis of instruction. For the present it is stored until some of the rooms belonging to the School of Mines can be vacated by the College.

2. The Mineralogical Laboratory is equipped with thousands of specimens and the latest improved apparatus for lecture purposes, and the students' laboratory work in crystallography, mineralogy, and petrography and zoölogy. The means of instruction are quite fully given in the Bulletin of the School of Mines which will be sent to any address on application.

3. The Geological Collection. Besides the special geological collections arranged in the laboratories and lecture-rooms of the School of Mines, the arrangements made through the courtesy of the Director and Trustees of the Carnegie Museum, with part of the staff, afford abundant opportunity for paleontological study.

4. The Engineering Museum. This collection was made by Professor Stewart for the special purpose of having at hand material for illustration in the course of Mechanical Engineering. The amount of material is not extensive, but careful selection and a preparation of much of it by cross-sectioning for a better exhibit of working parts has resulted in a collection of considerable value for purpose of general instruction.

5. The Mining Laboratory is being equipped with models and with machines of unusual size employed in practical mining; and plans are partially completed for reopening and completely equipping a mine located on the University Campus, near the School of Mines Building. The

needed apparatus and illustrative material for the study of general mining and practice in mining surveying is being acquired.

6. **The Assaying and Metallurgical Laboratories** are equipped with gas, coke and gasoline furnaces for fire assaying and metallurgical experimentation, while the laboratories are in the process of being fitted up for wet assaying and metallography.

7. **The Chemical Laboratories.** These, with the lecture room, occupy the entire third floor of the Engineering Building. Both lecture room and laboratories have been newly equipped throughout in the most modern manner. Separate laboratories have been installed in the following branches: Introductory Chemistry and Qualitative Analysis; Quantitative Analysis and Food Analysis, with Balance Room in connection; Gas and Fuel Analysis; Water Analysis; Organic Chemistry; Physical and Electro-Chemistry; Sproectscopy; Photography; Micro Chemistry and Research. On the fourth floor there is a special room for preparation and storage of distilled water, which is delivered by gravity to the various laboratories where it is on tap. A spacious store-room permits the distribution of supplies in such a manner that the requirements of students are promptly met. Machinery for suction and air pressure has been installed and a first class ventilating system provided so that the air in the laboratories may be pure at all times. The department library is well supplied with works of reference on chemistry for students' use.

8. **Physical Laboratories.** These are on the first and second floors of the Engineering Building. The lecture-room and a large apparatus-room adjoining are on the first floor. The lecture-room has a seating capacity of 150, and is provided with all the appliances to facilitate a complete course of experimental lectures.

The general physical laboratory on the second floor is very fully equipped with new apparatus, and is complete in its appointments in every respect. Smaller laboratories are provided for photometry, advanced laboratory practice and research.

A well-equipped shop and mechanician provide excellent facilities for making and repairing apparatus.

The equipment of the department is new and includes an excellent collection of instruments for accurate measurement and investigation.

9. **The Biological Laboratories** are in three rooms on the second floor of State Hall. Each student working in this department is provided with a compound microscope, for which he is personally responisble. The Laboratory is provided with two incubators—one for bacteriological work, the other for vertebrate embryology. The equipment includes a

Spencer rotary microtome, which is of great value in preparing serial sections of embryos, etc,. also an autoclav, paraffin baths, slide microtomes, physiological apparatus, micrometer balances, bacteriological apparatus, aquaria, etc.

10. **The Psychological Laboratory,** in State Hall, is provided with apparatus for practical experiments and demonstrations for the courses in psychology and for use in experimental study. The laboratory has the chief pieces of apparatus required in the mauals by Sanford and Titchner, besides supplementary pieces.

There is also a good collection of models of the brain and the sense organs including Auzoux models of brain, eye and ear; Ziegler models of the embryology of the human brain; the His models; and an assortment of materials for demonstration.

11. **Steam Laboratory.** There is provided the usual equipment for measuring the pressure, temperature and flow of steam such as gauges, thermometers, calorimeters, condensers, and indicators, together with suitable apparatus for standardizing and calibrating these.

12. **Engine and Power Laboratory.** The equipment for this department includes the following:

A Babcock & Wilcox 100 H. P., 200 pound pressure, boiler, with a superheating chamber, to be used in experimental and power plant work.

A composite cross-compound steam engine, 7½ inches and 18 inches by 14 inches, to be arranged to run condensing or noncodensing, high-pressure cylinder controlled by single-valve, low-pressure cylinder controlled by four valves; Corliss type. The engine is provided with a friction-brake, which serves for applying loads. Either side may be operated as a simple engine, condensing or noncondensing.

A two-cylinder Westinghouse gas-engine, provided with all necessary apparatus for making gas-engine tests; to be used for experimental purposes. In addition to this there are two three-cylinder Westinghouse gas-engines for power purposes located in the laboratory.

A motor-driven air-compressor for furnishing air for laboratory needs, and arranged to be used for experimental purposes.

13. **Materials Testing Laboratory.** This laboratory, when installation is complete, will be equipped with machines and instruments for the measurement of the physical properties of the materials of construction, and for tests on manufactured specimens.

Universal Testing Machines. This equipment includes three testing machines, ranging from 50,000 pounds to 200,000 pounds capacity, for tension, compression, and flexure tests. The 200,000-pounds capacity machine is capable of taking 15-foot columns, tension specimens accordingly, and flexure specimens up to 20-foot lengths.

Torsion Machine. This machine is designed for 230,000 inch-pounds, with a three-inch chucking capacity, and will care for lengths up to 15 feet.

Flexure Machine. This is a hand-power machine of 5,000 pounds capacity.

Cement-Testing Apparatus. The equipment includes two automatic briquette-testing machines, standard molds, scales, sieves, moist closet and other similar apparatus necessary for the examination of cement, cement-mortars and concrete.

Structural materials testing apparatus consists of experimental shearing and punching attachments for testing-machines, special extenso-meters for structural specimens, and a Hanna pneumatic riveter which has a capacity of 100,000 pounds die pressure.

14. Hydraulic Laboratory. For hydraulic experiments there are a Worthington two-stage turbine pump, driven by a variable-speed motor a Pelton wheel, and receiving and measuring tanks with weir discharge. There are also water-meters, orifices, nozzles, a Venturi meter, etc.

15. Elementary Mechanical Laboratory. The School of Engineering will occupy sections of the new Elementary Mechanical Laboratory at the opening of the Fall Term 1912. This Building when completed will cover an area of about 460 feet long and 40 feet wide.

The first sections to be erected will be devoted to heat treating, forging and casting of metals. To permit the study of up-to-date processes of working metals, the laboratory will contain representative types of forges and furnaces fired with coke, gas, and oil; drop forge equipment; the necessary apparatus and appliances for electric, oxy-acetylene, and thermit welding; equipment for brazing and pneumatic riveting; and the cold pressing, punching and drawing of metals.

This laboratory will also afford facilities for bench, floor, and machine molding; core making, and the running of heats in iron, brass and aluminum. The equipment will include a standard cupola, special furnaces for iron and brass, core ovens, representative molding machines, annealing furnace, tumbling barrel, and other foundry appurtenances.

A special room will be equipped for the more scientific study of the heat treatment of metals and will include barium chloride, lead, tempering, and annealing furnaces; pyrometers; etc.

16. Electrical Engineering Laboratories. The laboratories of the Electrical Engineering Department are located on the second floor of the Engineering Building and are provided with the necessary equipment to

enable the student to make all the desired tests in illustration of subjects presented in the lecture and class-room work.

The machine-laboratory equipment provides for the thorough testing of alternating and direct-current motors by various brake methods, the determination of characteristic curves of generators, synchronous converters, arc lamps, recording meters, storage batteries, etc. The following are some of the machines and equipment for use in the above tests.

Two Westinghouse 5 K. W., 125 volt, compound-wound generators; one General Electric, 15 H. P., 110 volt, D. C., shunt motor; one Westinghouse, 5 H. P., 110 volt, D. C., variable-speed interpole motor; one Westinghouse, 5 H. P., 110 volt, D. C., series motor; one 40 H. P., 440 volt, 3 phase, variable-speed motor; one Westinghouse, 5 K. W., motor-generator set, consisting of a 110 volt, D. C. generator direct-connected to a 220 volt, two-phase, induction motor; one Westinghouse, 5 H. P., 110 volt, single-phase, series motor; two Westinghouse, 7⅛ K. W., 110 volt, converters; one Westinghouse experimental converter, adapted for a single-phase, two-phase, or three-phase work; one Westinghouse, 5 H. P., 110 volt, three-phase induction motor; one 5 H. P., 110 volt, single-phase, induction motor; one 5 H. P., 110 volt, single-phase, series motor, and several other small motors for use in connection with special tests. In addition to these machines, there is a General Electric mercury-arc rectifier, various transformers, including those equipped with connections for phase transformation, recording watt-meters for both alternating and direct current, arc lamps, resistance and reactance coils, a 40 micro-farad condenser, prony brakes, balances, scales, 10 H. P. spring dynamometer and other equipment for general laboratory use.

The department switch-board is located in this laboratory and circuits connect with the different testing tables in this room and also in the photometer room, storage-battery room, standard measurement laboratory, together with the general laboratories of the Physics Department located in adjoining rooms. Thus connections can readily be made as desired in any laboratory with the general source of supply or to any machine in the testing laboratory for special work. Power is supplied to the board both from the Allegheny County Light Company and the University Power-Plant located in the Mechanical Laboratory. The board has permanent connections for supplying the following power: 220 volt, 3 wire direct current, 110 volt storage battery, 220 volt, two-phase, 110 volt three-phase, 110 volt single-phase, at 60 cycles and 110 volt single-phase at 15 cycles. As mentioned above when these do not meet the requirements the machines in the laboratory are readily available.

A storage battery of 60 cells, each of 120 ampere-hours capacity, is installed in a separate room especially arranged to afford easy access to the cells for testing purposes. This storage battery in addition to being used for testing purposes is also employed for instrument calibration and photometric work requiring a source of power-supply with constant difference of potential.

The photometric equipment is in a room devoted to the work and includes a three-meter Reichsanstalt-type photometer with both Lummer-Brodun and Bunsen screens, a National Bureau of Standards motor-driven type, universal rotator, standard amylacetate lamp, standard electric lamp, and necessary fittings for complete comparison of incandescent lamps.

In the standard-measurement laboratory arrangements have been made for work with the potentiometer, calibration of meters, measurements with standard resistances, capacities and inductances or other similar work. The equipment includes a Wolff potentiometer, arranged with ratio-coils in order that this may be used as a bridge, a set of Wolff ratio-coils and variable-resistance box which have been certified by the German Reichsanstalt, standards of self-induction, both fixed and variable, standard micro-farad condenser, two Kelvin balances, Siemens dynamometer, Weston standard laboratory voltmeter, standard-volt box and resistance for the calibration of volt-meter and ammeters, calibration coil for galvanometers, several galvanometers of modern type together with standard cells and other necessary equipment for exact methods in connection with thesis of other research work.

A small shop has been equipped and put in charge of a competent mechanician whose time is devoted to the maintenance of the laboratory equipment and the construction of new equipment for special work. This is of great advantage in connection with thesis work or any line of original investigation which it is desired to carry on as it greatly facilitates the erection of special devices which it would otherwise be difficult to secure. Students are also permitted to use the shop in connection with laboratory tests when desirable.

The establishment and endowment, by Mr. Andrew Carnegie, of a Museum in the city of Pittsburgh adds greatly to the facilities for study possessed by a student of the University. Since the completion of the very extensive additions to the building containing its large and varied collections, its advantages are, in many respects, unrivaled.

METHODS OF ADMISSION

Admission is by one of the following methods:

1. Examination. Examinations are held at the University, beginning at 9 o'clock in the morning on the three days following the Commencement in June, and on the three days preceding the opening of the College year in September. For 1912 these fall on June 13, 14 and 15, and September 26, 27 and 28.

Certificates of College Entrance Examination Board are accepted in lieu of the entrance examination at the University.

2. Certificate from Accredited Schools. Instead of examination, certificates from high schools and academies whose work has been approved by the University, and whose courses prepare for the Freshman class will be accepted. The official blank of certificate provided by the University must be used. It may be obtained, by application, from the Registrar.

3. From Other Colleges. Students from other institutions whose entrance requirements are equivalent to those of the University of Pittsburgh and which offer equivalent courses of study will be credited with the work they have done in such colleges, and admitted to advanced standing without examination.

REQUIREMENTS FOR ADMISSION

All candidates for admission to the School of Engineering must be at least sixteen years of age and furnish testimonials of good moral character. Those who come from other colleges must present certificates of regular dismissal.

The student applying for admission must offer fifteen units, a unit being a subject in which the work done is the equivalent of four recitations per week of one hour each for one year, or five of three-quarters of an hour each.

For admission to the School of Engineering the student must offer ten units, in following subjects:

English, *a*, 3 units.
Mathematics, *a. c*, Algebra, 1½ units.
Mathematics, *b*, *d*, Plane and Solid Geometry, 1½ units.
History, *a b, c, or d*, 1 unit.
German or French, *a*, *b*, 2 units.
Physics, 1 unit.
Five additional units must be offered from following subjects:
Chemistry, 1 unit.

Biology, 1 unit.
Drawing, 1 unit.
Physiography, ½ unit.
Shop Work, 1 unit.
Advanced History, 1 unit.
Advanced English, 1 unit.
Latin, *a*, *b*, 1 to 2 units.
German, 2 units.
French, 2 units.
Trigonometry, ½ unit.

EXPLANATION OF REQUIREMENTS FOR ADMISSION

The following subjects are accepted for admission:

English Composition and Literature

a. Three units. The preparation should include the following subjects:

(1) GRAMMAR—It is expected that the applicant will be familiar with the essentials of English grammar, and will be able to explain the construction of sentences that occur in the literature he has read.

(2) COMPOSITION AND RHETORIC—The student should know the elementary principles of rhetoric, and should be able to apply them in the construction of sentences and paragraphs, and in the planning of essays. The examination is chiefly practical, and involves the ability to write good English.

No student will be accepted whose paper is notably deficient in logical development of the subject, or in such details of form as spelling, punctuation, grammar, and division into paragraphs.

(3) LITERATURE—The books recommended are the Uniform College Entrance requirements in English. Other similar works will be accepted as equivalents.

The candidate is required to write one or more paragraphs on each of several subjects chosen from a considerably large number given in the examination paper. The questions on all of the books assume a knowledge of subject-matter and structure, but those on the books prescribed for study and practice call for more detailed treatment than those on books prescribed for reading.

A—The books prescribed for reading and practice are indicated in the following groups:

Select two sub-divisions from each of the following groups, except when substitution is made from group 2-5, as provided below. Each subdivision is set off by semicolons.

Group 1. The Old Testament, including the most important narrative parts of Genesis, Exodus, Joshua, Judges, Samuel, Kings and Daniel, together with the books of Ruth and Esther; the Odyssey, with the omission of Books I-V, XV-XVII; the Iliad with the omission of Books XI, XIII-XV, XXI; Virgil's Æneid. English translations of the Odyssey, the Iliad, and the Æneid, of acknowledged literary merit, must be used.

An equivalent amount from Groups 2-5 may be submitted for the two sub-divisions of this group.

Group 2. Shakespeare's *Julius Caesar; The Merchant of Venice; As You Like it; A Midsummer-Night's Dream; Twelfth Night; Henry V.*

Group 3. Goldsmith's *The Vicar of Wakefield;* either Scott's *Ivanhoe* or Scott's *Quentin Durward;* Hawthorne's *The House of the Seven Gables;* Thackeray's *Henry Esmond;* either Dickens's *David Copperfield,* or Dickens's *A Tale of Two Cities;* Mrs. Gaskell's *Cranford;* George Eliot's *Silas Marner;* Stevenson's *Treasure Island;* Defoe's *Robinson Crusoe,* Part 1.

Group 4. The de Coverley Papers in *The Spectator;* Franklin's *Autobiography;* Bunyan's *Pilgrim's Progress,* Part I; Irving's *Sketch-Book;* Macaulay's Essays on Clive and Hastings; Thackeray's *English Humorists;* selections from Lincoln, including at least two Inaugurals, the speeches in Independence Hall and at Gettysburg, the *Last Public Address,* and the *Letter to Horace Greeley,* together with a short memoir or estimate; Parkman's *Oregon Trail;* Thoreau's *Walden;* Huxley's *Autobiography* and selections from *Lay Sermons,* including addresses on *Improving Natural Knowledge, A Liberal Education,* and *A Piece of Chalk;* Stevenson's *Inland Voyage* and *Travels With a Donkey.*

Group 5. Palgrave's *Golden Treasury* (First Series), Books II and III, with special attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's *Elegy in a Country Churchyard* and Goldsmith's *The Deserted Village;* Coleridge's *The Ancient Mariner* and Lowell's *The Vision of Sir Launful;* Scott's *The Lady of the Lake;* Byron's *Childe Harold, Canto* IV, and *The Prisoner of Chillon;* Palgrave's *Golden Treasury,* (First Series), Book IV, with special reference to Wordsworth, Keats, and Shelley; Poe's *The Raven,* Longfellow's *The Courtship of Miles Standish,* and Whittier's *Snow-Bound;* Macaulay's *Lays of Ancient Rome, and* Arnold's *Sohrab and Rustum;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Home thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, Herve Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City.*

B—The books prescribed for study and practice are:

Shakespeare's *Macbeth; Milton's Lycidas, Comus, L'Allegro,* and *Il*

Penseroso; Burke's *Speech on Conciliation with America,* or Washington's *Farewell Address and Webster's First Bunker Hill Oration;* Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns.*

Applicants who are not graduates of accredited high schools, or who have not passed the uniform entrance examinations, will be required to present themselves at the University of Pittsburgh entrance examinations, held three days preceding the opening of the fall term.

b. One unit.

Advanced standing in English may be given to the graduates of high schools that have exceptionally strong and thorough courses in English throughout the entire four years. This requires additional work in literature and, especially, a thorough knowledge of the elementary principles of rhetoric, and the ability to write good English.

Mathematics

a. ALGEBRA THRU QUADRATICS

One unit. The four fundamental operations for rational algebraic expressions. Factoring, determination of highest common factors and lowest common multiple by factoring. Fractions, including complex fractions, ratio and proportion. Linear equations, both numerical and literal, containing one or more unknown quantities. Problems depending on linear equations. Radicals, including the extraction of the square root of polynominals and of numbers. Exponents, including the fractional negative.

Quadratic equations, both numerical and literal. Simple cases of equations with one or more unknown quantities, that can be solved by the methods of linear or quadratic equations. Problems depending on quadratic equations. The binomial theorem for positive integral exponents.

b. PLANE GEOMETRY

One unit. The usual theorems and constructions of the text-books, including the general properties of plane rectillinear figures; the circle and the measurement of angles; similar polygons; areas, regular polygons and the measurement of the circle. The solution of numerous original exercises. Applications to mensuration.

c. ADVANCED ALGEBRA

One-half unit. Ratio, proportion and variation, variables and limits, properties of series, including the binomial theorem for exponents of all kinds; the progressions; use of undetermined coefficients; permutations and combinations; logarithms, computation and use; summation of recurring series; method of differences; interpolation.

d. SOLID GEOMETRY

One-half unit. The usual theorems and constructions of good text-books, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders, and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including loci problems. Applications to the mensuration of surfaces and solids.

e. PLANE TRIGONOMETRY

One-half unit. A comprehensive treatment as given in ordinary texts, including trigonometric functions of angles, Goniometry and the solutions of right and oblique triangles.

History

One unit each.

a. Ancient history, with special reference to Greek and Roman history, and including also a short introductory study of the more ancient nations and the chief events of the early Middle Ages, down to the death of Charlemagne (814).

b. Mediæval and modern European history, from the death of Charlemagne to the present time.

c. English history.

d. American history and civil government.

Each of the above topics is intended to represent one year of historical work, wherein the study is given five times a week, or two years of historical work, wherein the study is given three times a week.

Latin

One unit each.

a. Grammar and elementary prose composition. A thorough knowledge of all regular inflections, all common irregular forms, the fundamentals of syntax, and a select vocabulary.

b. Cæsar, Gallic War, books I-IV, or the equivalent from other books of the Gallic War or the Civil War, or Nepos' Lives. The examination consists of translation at sight of narrative prose similar to the above.

c. Cicero, the four orations against Catiline and the orations for Archias and for the Manilian Law, or the equivalent from other orations of Cicero or from his letters, or from Sallust's Catiline and Jugurtha, except that the orations for the Manilian Law and for Archias are required. Advanced prose composition. The examination consists of translation (together with historical, literary, and grammatical qusetions) partly of passages taken from the two required orations, and partly at sight of passages similar to the above in vocabulary, syntax, and range of ideas. In addition, there is an examination in prose composition.

d. Virgil, Æneid, books I-VI, or the equivalent from other books of the Æneid, or from the Bucolics or Georgics, or from Ovid Metamorphoses, Fasti, or Tristia, except that Æneid I, II and either IV or VI are required. The examination consists of translation (together with questions on grammar, prosody, literary and historical allusions, and subject-matter) partly of passages taken from the required books, and partly at sight of passages similar to the above in vocabulary, syntax, and range of ideas.

German

One unit each.

a. Elementary German. During the first year the work should comprise (1) careful drill upon pronunciation; (2) the memorizing and frequent repetition of easy colloquial sentences; (3) drill upon the rudiments of grammar; (4) abundant easy exercises designed, not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (5) the reading from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lessons.

b. Second Year German. During the second year the work should comprise (1) the reading of from 150 to 200 pages of literature in the form of easy stories and plays; (2) practice as before, in the translation into German of easy variation upon the matter read, and also in the reproduction, orally and in writing, of the substance of short and easy selected passages; (3) continued drill upon the rudiments of the grammar.

Stories suitable for the elementary course can be selected from the following list: Grimms' *Maerchen,* Gerstack's *Germelshausen,* Heyse's *L'Arrabbiata,* Storm's *Immense,* Baumbach's *Der Schwiergersohn,* Schokke's *Der Zerbrochene Krug,* Hillern's *Hoeher als Die Kirche.*

Among shorter plays the best available are perhaps: Benedix's *Der Prozess, Der Weiberfreund;* Elz's *Er ist nich eifersuechtig;* Wichert's *An der Majorsecke;* Wilhelm's *Einer muss heiraten.*

c. Third Year German. The work should comprise the reading of about 400 pages of moderately difficult prose and poetry with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatrical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tense and modes, and likewise upon word-order and word-formation.

Suitable reading matter for the third year can be selected from such works as the following: Freytag's *Die Journalisten* and *Bilder aus der Deutschen Vergangenheit*—for example, *Karl der Grosse, Aus den Kzeuzzuegen, Doktor Luther, Aus dem Staat Friedrichs des Grossen,* Gerstæcker's *Irrfahrten,* Hoffman's *Historische. Erzaehlungen,* Riehl's *Der Fluch der Schoenheit,* Schiller's *Wilhelm Tell, Der Neffe als Onkel, Das Lied von der Glocke,* Wildenbruch's *Das edle Blut.*

French

One unit each.

a. Elementary French. In the first year the work should comprise (1) careful drill in pronunciation; (2) the rudiments of grammar; (3) easy composition; (4) the reading of from 150 to 200 duodecimo pages of easy French prose; (5) the writing of French from dictation.

b. Second Year French. During the second year the student should read from 300 to 400 pages of easy modern prose. Suitable texts are: Halevy's *L' Abbè Constantin;* Bruno's *Le tour de la France;* Malot's *Sans famille;* Labiche and Martin's *La poudre aux yeax* and *Le vayage de M. Perrichon;* Dumas' *L' Evasion du Duc de Beaufort.* Continued drill upon the rudiments of grammar, the mastery of the chief irregular verbs, dictation, practice in French conversation.

c. Third Year French. In the third year from 500 to 600 pages of French of ordinary difficulty should be read. The essentials of French syntax are required, with constant practice in the use of spoken French. Suitable texts are: Daudet's *Contes;* About's *Le Roi des Montagnes;* Merimée's *Colomba;* Augier's *Le Gendre de M. Poirer;* Mollière's *Le Bourgeois Gentilhomme;* Maupassant's *Contes;* George Sand's *La Mare au Diable;* Scribe's plays.

Physics

One unit.

The candidate will be expected to be familiar with the fundamental principles of Physics. A sufficiently extended treatment of the subject will be found in any of the principal text-books now in use in secondary schools, such, for instance, as Milliken and Gale, Carhart and Chute, Hoadley, Mann, and Twiss.

It is furthermore very desirable for the student to have received training in laboratory work; but for the present no laboratory work will be required.

Chemistry

One unit. The knowledge gained, if elementary, should be comprehensive and exact, including facts and laws. Laboratory work, emphasizing descriptive chemistry is necessary and notes of this work must be presented. Much attention should be given to solution of problems.

Biology

One unit. Under this one head are grouped the subjects of botany, zoölogy, and physiology. The one unit may be composed of a single subject or of any combination of two. Laboratory exercises or field work equal in time at least to that given to text-book and lecture is essential. In offering subject for credit the names of the text-books used should be given.

Physiography

One-half unit. This subject, otherwise known as physical geography, must have been pursued as a special subject and not as a part of the earlier study of general geography, and a standard text-book, dealing with the subject solely must have been used.

Drawing

One unit. Either free-hand or mechanical drawing, or both, may be offered. Specimens of the work done must be presented, properly certified by the instructor, with a statement of the length of time taken in the course which they represent.

Shop-Work

One unit. The work done must usually have been of the systematic kind prescribed in courses of manual training.

CONDITIONS

No student with more than three units of entrance conditions will be admitted to regular classification. Conditions must be partly removed before the second year and wholly before the third.

Advanced Standing.—Students entering with more than 15 units may receive college credit for high school work in excess of the 15 only by taking special examination in this work on entering the University.

Students in the School of Engineering who fail to pass in 50 per cent of their work will not be registered in the following term except by special action of the faculty.

TUITION AND FEES

The tuition covers all fees except those specified below and must be paid upon registration, with all current fees, before name can be entered on class rolls.

Tuition

First term, every year	$ 40.00
All other terms, each	35.00
If paid in advance for three (3) terms	105.00

Fees

Matriculation, payable on admission to University	$ 5.00
Diploma	5.00
Gymnasium, each term	2.00
Chemistry, each course	5.00
Physics, each laboratory course	5.00
Biology, one course	3.50
Biology, each additional course	1.75
Engineering Laboratory, each term	5.00
Shop, each term	5.00

DEGREES IN ENGINEERING

The degrees conferred upon those who have been in residence during their last year and who shall complete satisfactorily the courses offered by the School of Engineering will be respectively:

Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, Bachelor of Science in Electrical Engineering, Bachelor of Science in Chemical Engineering, Bachelor of Science in Sanitary Engineering.

Thesis. A thesis is required of every candidate for any one of the degrees given. The thesis subject, together with an outline of the work proposed, must be approved by the head of the department in which the student is classified, not later than January 15th preceding commencement; and when so approved will be assigned him on a blank furnished for the purpose. A memorandum of this assignment must be filed in the office of the Dean.

The thesis in the proposed final form should be submitted to the Professor in charge at least two weeks prior to commencement.

The results obtained and the thesis prepared in connection with a regularly assigned thesis subject are the property of the University and no part of the thesis may be published without the consent of the Chancellor.

Upon giving evidence of having successfully practiced engineering for a period of at least three years, accompanied by a satisfactory thesis showing the application of engineering principles to some important project, the corresponding engineering degree will be conferred upon graduates of this school.

ADVANCED STANDING IN ENGINEERING COURSES

Graduates of the College of this University, or of any other college of high standing, who desire to prepare themselves for the engineering profession, will be matriculated in the School of Engineering upon presentation of their diplomas and evidence that they have pursued mathematical and scientific studies justifying their entering one of the advanced classes. By availing themselves of this provision graduates from classical or general scientific courses may obtain a professional training in engineering in two or three years after taking a first degree, and may enter upon their practical work with a broader education than can be obtained by taking a regular engineering course. Students of the University, in the College, will be advised as to the best selection of electives to make, to the end that they may enter an engineering course for an additional degree at as high a point as possible and with the fewest conditions.

COURSES IN ENGINEERING

The several courses in engineering, are planned to meet fully the requirements of prospective engineers, but are subject to some modification in the case of students who are preparing for a special branch of the engineering profession. Proposed substitutes for prescribed courses must be approved by the heads of the departments concerned, at least two weeks before the beginning of the term in which such courses are scheduled.

All regular courses are made up of eleven terms of eleven to twelve weeks each, spent in school, and four terms spent in the engineering industries of the Pittsburgh district, making a total of fifteen terms' work required for graduation.

The schedule of work in the co-operative plan adopted is as follows: during the Freshman year, the last term of the Sophomore year, and the whole of the Senior year, all students of the same class are together in school. During the rest of the time, each class is divided into two sections which alternate quarterly between school and practical work. The first year's work is the same for all, and lays a broad foundation for any engineering course, at the same time giving the student a year in which to become so familiar with the different courses that he may decide which to pursue, with greater confidence in his choice.

Mechanical Railway Engineering

A Department of MECHANICAL RAILWAY ENGINEERING has been organized under the direction of Mr. D. F. Crawford, General Superintendent of Motive Power, Pennsylvania Lines West of Pittsburgh, to serve the interests of those students who desire to specialize along this line.

To a thorough foundation of the elements of Mechanical Engineering will be added those subjects which will contribute most toward preparation for Railroad work. Further details concerning this course will be announced later.

COURSE IN CIVIL ENGINEERING.

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 & 6	48	5	5	7	48	5	5	8	48	5	5
Chem	3 or 5	49	8	4	4 or 6	49	8	4	8	50	8	4
Graph	1	29	3	1	2	29	3	1	3	29	6	2
M. Eng	1A	35	7	3	2A	35	7	3	3A	35	7	3
C. Eng	....	......	..	..	.....	......	..	.	1	30	5	3
Ger. or Rom	1	53-54	3	3	2	53-54	3	3	3	53-54	3	3
Engl	4	52	4	4	5	52	4	4	6	53	2	2
Phys. Ed	....	......	3	1	.....	......	3	1	....	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	48	4	4	10	48	4	4	....	......	..	..
Phys	11	49	7	5	12	49	7	5	13	49	7	5
Graph	4	29	6	2	5	29	8	4	...	......	..	..
C. Eng	2	31	7	3	3	31	3	1	5	31	8	4
C. Eng	.....	......	..	.	19	34	1	1	19	34	1	1
Psych	.....	......	..	..	4	52	3	3	....	......	..	..
Biol	.....	......	..	.	.....	......	..	.	3	51	4	2
Min	.....	......	..	..	.....	......	..	.	1	52	7	3
Mech	.....	......	..	.	.....	......	..	.	1	30	5	5
Ger. or Rom	7	54	3	3	8	54	3	3	....	......	..	..
Engl	*7	53	3	3	.....	......	..	.	....	......	..	..
Phys. Ed	.....	.....	3	1	.....	......	3	1	....	......	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5	.....	......	..	..				
Mech	3	30	6	2	.....	......	..	..				
Mech	4	30	7	3	.....	......	..	..				
S. Eng	.....	......	..	..	1	44	4	4				
S. Eng	.....	......	..	..	2	44	3	1				
C. Eng	6	32	4	2	7	32	2	2				
C. Eng	19	34	1	1	15	34	5	5				
C. Eng	....	.....	..	..	19	34	1	1				
E. Eng	2	41	5	3	.....	......	.	..				
M. Eng	....	.....	..	..	4	37	5	3				
Geol	5	52	3	3	6	52	3	3				
Econ	3E	46	3	3	.....	......	..	..				
Astron	....	.....	..	..	1	52	3	3				
	FALL TERM				WINTER TERM				SPRING TERM			
C. Eng	4	31	6	4	10	32	6	2	12	33	5	3
C. Eng	8	32	3	3	11	32	7	3	14	33	4	2
C. Eng	9	32	6	2	13	33	4	2	18	34	10	4
C. Eng	16	34	10	4	17	34	10	4	....	.....	..	.
C. Eng	19	34	1	1	19	34	1	1	19	34	1	1
C. Eng	20	35	3	1	20	35	3	1	20	35	3	1
C. Eng	...	.....	..	..	21	35	..	2	21	35	..	4
Econ	10	47	2	2	11	47	2	2	..	......	..	..
Econ	13	47	2	2	16	47	2	2	46	48	3	3
Econ	21	47	2	2	24	48	2	2	....	......	.	..
M. Eng	....	.....	..	..	.....	......	..	..	15	39	5	3

COURSE IN MECHANICAL ENGINEERNG.

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 & 6	48	5	5	7	48	5	5	8	48	5	5
Chem	3 or 5	49	8	4	4 or 6	49	8	4	8	50	8	4
Graph	1	29	3	1	2	29	3	1	3	29	6	2
M. Eng	1A	35	7	3	2A	35	7	3	3A	35	7	3
C. Eng	....	......	..	..	....	......	..	..	1	30	5	3
Ger. or Rom	1	53-54	3	3	2	53-54	3	3	3	53-54	3	3
Engl	4	52	4	4	5	52	4	4	6	53	2	2
Phys. Ed	.....	......	3	1	....	......	3	1	.....	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	48	4	4	10	48	4	4	....	......	..	..
Phys	11	49	7	5	12	49	7	5	13	49	7	5
Graph	4	29	6	2	5	29	8	4	....	......	..	..
Mech	....	......	..	..	....	....	.	.	1	30	5	5
M. Eng	4A	36	4	2	5A	36	4	2	6A	36	4	2
Ger. or Rom	7	54	3	3	8	54	3	3	9	54	3	3
Engl	*7	53	3	3	...	......	.	..	...	......	..	..
Biol	....	......	..	..	....	......	..	..	3	51	4	2
Min	....	......	..	..	....	......	..	..	1	52	7	3
Psych	....	......	..	..	4	52	3	3	...	......	..	..
Phys. Ed	....	......	3	1	....	......	3	1	....	......	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	3	....	......	..	..				
Mech	3	30	6	2	....	......	..	..				
S. Eng	....	......	..	..	1	44	4	4				
S. Eng	....	......	..	..	2	44	3	1				
M. Eng	1	36	5	3	2	36	8	4				
M. Eng	....	......	..	..	4	37	5	3				
E. Eng	3	41	5	3	4	41	5	3				
C. Eng	....	......	..	..	7	32	2	2				
Phys	....	......	..	..	15	49	4	2				
Econ	3E	46	3	3	.....	......	..	..				
	FALL TERM				WINTER TERM				SPRING TERM			
M. Eng	3	37	7	3	6	37	2	2	10	38	3	3
M. Eng	5	37	4	4	7	37	1	1	11	38	5	3
M, Eng	16	40	3	1	8	38	5	3	12	39	5	3
M. Eng	17	40	1	1	9	38	7	3	14	39	3	1
E. Eng	5	41	5	3	.....	......	..	..	....	......	..	..
C. Eng	16	34	10	4	....	......	..	..	.....	......	..	..
C. Eng	9	32	6	2	.....	......	..	..	.....	......	..	..
M. Eng	.....	......	..	..	13	39	6	2	15	39	5	3
M. Eng	.....	......	..	..	16	49	3	1	16	40	3	1
M. Eng	.....	......	..	..	17	40	1	1	17	40	1	1
M. Eng	.....	......	..	..	18	40	..	3	18	40	..	3
Econ	13	47	2	2	16	47	2	2	46	48	3	3
Econ	21	47	2	2	24	48	2	2	.....	......	..	..

COURSE IN ELECTRICAL ENGINEERING.

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	No.
Math	5 & 6	48	5	5	7	48	5	5	8	48	5	5
Chem	3 or 5	49	8	4	4 or 6	49	8	4	8	50	8	4
Graph	1	29	3	1	2	29	3	1	3	29	6	2
M. Eng	1A	35	7	3	2A	35	7	3	3A	35	7	3
C. Eng	.....	......	..	.	.....	......	..	.	1	30	5	3
Ger. or Rom	1	53-54	3	3	2	53-54	3	3	3	53-54	3	3
Engl	4	52	4	4	5	52	4	4	6	53	2	2
Phys. Ed	.....	......	3	1	.....	......	3	1	.....	.....	3	1
	SUMMER OR WINTER TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	48	4	4	10	48	4	4	.....	......	..	..
Phys	11	49	7	5	12	49	7	5	13	49	7	5
Graph	4	29	6	2	5	29	8	4	.....	......	..	..
Mech	.....	......	..	.	.....	......	..	..	1	30	5	5
M. Eng	4A	36	4	2	5A	36	4	2	6A	36	4	2
Ger. or Rom	7	54	3	3	8	54	3	3	9	54	3	3
Engl	*7	53	3	3	.....	......	..	..	.....	......	..	..
Biol	.....	......	..	..	.....	......	..	..	3	57	4	2
Min	.....	......	..	..	.....	......	..	..	1	52	7	3
Psych	.....	......	..	..	4	52	3	3	.....	......	..	..
Phys. Ed	.....	......	3	1	.....	.....	3	1	.....	......	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5	.....	......	..	..				
Mech	3	30	6	2	.....	......	..	..				
S. Eng	.....	......	..	..	1	44	4	4				
S. Eng	.....	......	..	..	2	44	3	1				
Math	13	48	2	2	.....	......	..	..				
Phys	14	49	7	3	15	49	7	3				
E. Eng	1	40	5	5	6	41	3	3				
E. Eng	15	42	3	1	16	42	3	1				
M. Eng	.....	......	..	..	2	37	8	4				
M. Eng	.....	......	.	..	4	37	5	3				
Econ	3E	46	3	3	.....	......	..	..				
	FALL TERM				WINTER TERM				SPRING TERM			
E. Eng	7	41	3	3	8	42	3	3	9	42	3	3
E. Eng	10	42	3	3	11	42	3	3	12	42	3	3
E. Eng	13	42	8	4	14	42	8	4	19	43	6	2
E. Eng	17	43	6	2	18	43	6	2	20	43	1	1
E. Eng	20	43	1	1	20	43	1	1	22	43	7	3
E. Eng	.....	......	..	..	22	43	6	2	....	......	..	..
Phys	.....	......	..	..	30	49	3	3	31	49	3	3
M. Eng	5	37	4	4	.....	.....	..	..	15	39	5	3
Econ	13	47	2	2	16	47	2	2	46	48	3	2
Econ	21	47	2	2	24	47	2	2	....	......	..	..

COURSE IN SANITARY ENGINEERING.

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 & 6	48	5	5	7	48	5	5	8	48	5	5
Chem	3 or 5	49	8	4	4 or 6	49	8	4	8	50	8	4
Graph	1	29	3	1	2	29	3	1	3	29	6	2
M. Eng	1A	35	7	3	2A	35	7	3	...	......	..	..
C. Eng	.....	......	..	..	.....	......	..	..	1	30	5	3
Ger or Fr.	1	53-54	3	3	2	53-54	3	3	3	53-54	3	3
Engl.	4	52	4	4	5	52	4	4	6	53	3	3
Phys. Ed	.....	.....	3	1	.....	.....	3	1	...	.....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	48	4	4	10	48	4	4	...	......	..	..
Chem	9	50	7	3	10	50	7	3	11	50	7	3
Phys	11	49	7	5	12	49	7	5	13	49	7	5
C. Eng	2	30	7	3	3	30	3	1	...	......	..	..
Ger. or Fr.	7	54	3	3	8	54	3	3	9	54	3	3
Mech	.....	......	..	..	.....	......	..	..	1	30	5	5
Biol	.....	......	..	..	.....	......	..	..	3	51	5	3
Engl	7	53	3	3	.....	......	..	..	...	......	..	..
Phych	.....	......	..	..	4	52	3	3	...	......	..	..
Phys. Ed	.....	.....	3	1	.....	.....	3	1	...	.....	3	1
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5	.....	......	..	..				
Mech	3	30	6	2	.....	......	..	..				
Mech	4	30	7	3	.....	......	..	..				
S. Eng	.....	......	..	..	1	44	4	4				
S. Eng	.....	......	..	..	2	44	3	1				
S. Eng	.....	......	..	..	3	44	7	3				
S. Eng	12	46	1	1	12	46	1	1				
Biol	17	51	7	4	18	51	7	4				
Geol	2	52	3	3	5	52	3	3				
Econ	3E	46	3	3	.....	......	..	..				
C. Eng	.....	......	..	..	7		2	2				
M. Eng	.....	......	..	..	4		5	3				
	FALL TERM				WINTER TERM				SPRING TERM			
S. Eng.	4	44	6	2	5	45	2	2	9	45	5	3
S. Eng.	.....	......	..	..	6	45	2	2	...	......	..	..
S. Eng.	.....	......	..	..	7	45	4	2	8	45	4	2
S. Eng.	.....	......	..	..	10	45	7	3	11	46	4	2
S. Eng.	12	46	1	1	12	46	1	1	12	46	1	1
S. Eng.	13	46	3	1	13	46	3	1	13	46	3	1
S. Eng.	14	46	1	1	14	46	1	1	14	46	1	1
S. Eng.	.....	......	..	..	15	46	..	2	15	46	..	5
Biol	19	51	7	4	.....	.....	..	..	...	.....	..	..
Biol	21	51	2	2	.....	.....	..	..	...	.....	..	..
C. Eng.	8	32	3	3	.....	.....	..	..	...	.....	..	..
C. Eng.	9	32	6	2	.....	.....	..	..	...	.....	..	..
C. Eng.	16	34	10	4	11	32	7	3	12	33	3	3
Econ	21	47	2	2	16	47	2	2	46	48	3	3
Econ	.....	......	..	..	24	47	2	2	...	.....	..	..

COURSE IN CHEMICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs	Hrs.	Cdts.
Math	5 & 6	48	5	5	7	48	5	5	8	48	3	3
Chem	3 or 5	49	8	4	4 or 6	49	8	4	8	50	8	4
Graph	1	29	3	1	2	29	3	1	3	29	6	2
M. Eng	1A	35	7	3	2A	35	7	3	3A	35	7	3
C. Eng	....	......	..	..	....	......	..	..	1	30	5	3
Ger. or Rom	1	53-54	3	3	2	53-54	3	3	3	53-54	3	3
Engl	4	52	4	4	5	52	4	4	6	53	2	2
Phys. Ed	......	......	3	1	....	......	3	1	....	......	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	48	4	4	10	48	4	4				
Phys	11	49	7	5	12	49	7	5	13	49	7	5
Graph	4	29	6	2	5	29	8	4	...	......	..	..
Chem	9	50	7	3	10	50	7	3	11	50	7	3
Ger. or Rom	7	54	3	3	8	54	3	3	9	54	3	3
Engl	7	53	3	3	....	......	..	..	...	......	..	..
Mech	......	......	..	..	....	......	..	..	1	30	5	5
Min	......	......	..	..	....	......	..	..	1	52	7	3
Phys. Ed	......	......	3	1	....	......	3	1	...	......	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5	....	......	..	..				
Mech	3	30	6	2	....	......	..	..				
Chem	12	30	7	3	....	......	..	..				
Chem	15	50	8	4	16	50	8	4				
E. Eng	3	41	5	3	4	41	8	4				
M. Eng	......	......	..	..	2	37	8	4				
M. Eng	......	......	..	..	4	37	5	3				
Phys	14	49	4	2	15	49	4	2				
Econ	3E	46	3	3	....	......	..	..				
	FALL TERM				WINTER TERM				SPRING TERM			
Chem	27	57	2	2	28	57	2	2	29	51	2	2
Chem	......	......	..	..	22	51	2	2	23	51	2	2
E. Eng	5	41	5	3	....	......	..	..	....	......	..	..
M. Eng	5	37	4	4	6	37	2	2	11	38	5	3
M. Eng	......	......	..	..	....	......	..	..	15	39	5	3
Phys	......	......	..	..	....	......	..	..	16	49	3	1
Econ	13	47	2	2	16	47	2	2	46	48	3	3
C. Eng	8	32	3	3	....	......	..	..	....	......	..	..
Thesis	......	......	..	..	....	....	..	5	....	......	..	5

Graphics

1. MECHANICAL DRAWING

MR. LAMBIE Fall Term, 1 credit

The care and use of drafting instruments, instrument exercises, geometrical constructions, lettering, shading, exercises in drawing to scale, and dimensioning.

Three hours per week in drafting room. Freshman year.

2. MECHANICAL DRAWING

MR. LAMBIE Winter Term, 1 credit

Orthographic projections, rotation of objects, oblique projections, intersections, and development of surfaces.

Three hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 1.

3. MECHANICAL DRAWING

MR. LAMBIE Spring Term, 2 credits

Isometric drawing and dimensioning, sectioning, and machine drawing.

Six hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 2.

4. MECHANICAL SKETCHING AND DRAFTING

MR. LAMBIE Summer or Fall Term, 2 credits

Graded exercises in the measuring and sketching of mechanical constructions, and the subsequent detail drafting of the same.

Six hours per week in drafting room. Sophomore year.

Pre-requisite: Graphics 3.

5. DESCRIPTIVE GEOMETRY

MR. LAMBIE Winter or Spring Term, 4 credits

A critical study of the science of representing by drawing. The location of points, lines, planes, single curved surfaces, surfaces of revolution, and warped surfaces, with their relations to each other; tangent lines and planes; intersection of surfaces; shades, shadows, and perspective.

Two lectures and six hours in drafting room per week. Sophomore year.

Pre-requisites: Graphics 4; Mathematics 7.

6. APPLIED DESCRIPTIVE GEOMETRY

PROFESSOR SMITH 2 credits

The application of descriptive geometry and advanced drawing to engineering problems, including patterns of the developable surfaces, templets in true proportions, and detailed isometric drawings of various parts of the structures. Also, practice in the construction of templets, patterns, etc., with their use.

Six hours drawing per week.

Elective in all engineering courses.

Pre-requisite: Graphics 5.

Mechanics

1. ANALYTIC MECHANICS

DR. WENRICH Spring or Summer Term, 5 credits

This subject comprises among its topics the composition and resolution of forces, the center of gravity, the moment of inertia radius of gyration, laws of friction and of motion, projectiles, impact, machines, work, and energy. The solution of numerous problems in application of formulas is constantly required.

Five recitations and lectures per week. Sophomore year.

Pre-requisite: Mathematics 10.

2. MECHANICS OF MATERIALS

PROFESSOR STEWART Fall or Winter Term, 5 credits

The resistance and elasticity of materials. The action of beams under various conditions of fixity and loading; strength of columns and shafts; combined stresses; resilience of materials; etc.

Five recitations and lectures per week. Junior year.

Pre-requisite: Mechanics 1.

3. MECHANICAL LABORATORY

ASSISTANT PROFESSOR RICHARDSON Fall or Winter Term, 2 credits

The experimental study of the physical properties of the materials of construction, such as iron and steel, wood, brick, stone, cement, and concrete.

Six laboratory-hours per week. Junior year.

To be taken concurrently with Mechanics 2.

4. GRAPHIC STATICS

MR. BANKSON Fall or Winter Term, 3 credits

The solution of problems in which the stresses in frame work, beams, roof and bridge trusses are ascertained by graphical methods. Methods for dead, snow, wind, and live loads.

One lecture and six hours drawing per week. Junior year.

Pre-requisites: Graphics 1; Mechanics 1.

Civil Engineering

1. SURVEYING

MR. BANKSON Spring Term, 3 credits

Lectures, recitations, and field work in the theory, use, and care of surveying instruments. The field work consists of measuring lines and angles; determining areas, running levels, dividing of land, re-location of boundaries, staking out of buildings, etc. Methods of keeping notes are explained, and notes and plots are required of every student.

Two recitations and three hours field work per week. Freshman year.

Pre-requisite: Mathematics 5.

2. TOPOGRAPHY

MR. BANKSON Summer or Fall Term, 3 credits

A course in topographical surveying, including the theory and practice of transit, plane table and stadia methods. Also the applications of railroad, highway, municipal, and hydrographical surveying.

A complete topographic survey is executed. Complete notes and a topographical map are required of every student.

One recitation and six hours field work per week. Sophomore year.

Pre-requisite: C. E. 1.

3. TOPOGRAPHY

MR. BANKSON Winter or Spring Term, 1 credit

A continuation of Course C. E. 2.

Three hours drawing per week. Sophomore year.

4. GEODESY

PROFESSOR SMITH Fall Term, 4 credits

A study of the precise methods used in geodetic and topographical surveying. The mathematical development of the principles, and the application of the method of least squares, in finding the most probable values, and probable errors, of magnitudes observed in plane and geodetic surveys. Field work, including the measurement of base lines, triangulation and topography.

Three recitations and three hours field work per week. Senior year.

Pre-requisites: C. E. 3; Mathematics 10; Astronomy 1.

5. RAILROAD ENGINEERING, LOCATION

MR. BANKSON Summer Term, 4 credits

The reconnoissance, the preliminary survey, and the staking out the center line. The student is required to perform the necessary mathematical calculations incident to the running of simple, compound, and transition curves, overcoming of obstacles, change of location, etc. The line is subsequently leveled, benches and reference points established, topography taken, and the profile made. The student is taught the best methods of keeping the field notes and of checking them, and is given exercises in the solution of problems pertaining to frogs and switches, turnouts and crossings, and the practical application of the same in the field.

Two recitations and six hours of field work per week. Sophomore year.

Pre-requisite: C. E. 3.

6. RAILROAD ENGINEERING, CONSTRUCTION

MR. BANKSON — Fall or Winter Term, 2 credits

The student is exercised in the means and methods of cross-sectioning, determination of grades, staking out excavations and embankments, calculating earth work, making estimates on haulage; the classification of earth work, staking out culverts, bridge piers, abutments, and tunnels. Forms and dimensions of tunnels are considered, together with the means and methods of excavation and cost of the work.

One recitation and three hours of calculations and estimates per week. Junior year.

Pre-requisite: C. E. 5.

7. MASONRY CONSTRUCTION AND FOUNDATIONS

MR. LAMBIE — Spring or Summer Term, 2 credits

A study of the preparation, strength, and durability of building stones, bricks, common lime mortar, hydraulic cement mortar, and concrete; and the different kinds of masonry construction, such as dams, retaining walls, bridge piers and abutments; also the preparation of ordinary foundations, pile foundations, and foundations under water. Visits of inspection are made, when the opportunity offers, to see work in the process of construction.

Two recitations and lectures per week.

Pre-requisite: Mechanics 4.

8. CONCRETE ENGINEERING

MR. LAMBIE — Fall Term, 3 credits

A study of the mechanics of reinforced concrete, together with applications to the design of typical structures in buildings, bridges, etc. This course should be taken with C. E. 9.

Three lecture hours per week. Senior year.

Pre-requisites: Mechanics 2 and 4.

9. ENGINEERING LABORATORY

PROFESSOR SMITH — Fall Term, 2 credits

This course comprises laboratory work generally related to structural engineering in steel and concrete.

Six laboratory hours per week. Senior year.

Pre-requisites: Mechanics 2, 3, and 4.

10. ENGINEERING LABORATORY

PROFESSOR SMITH — Winter Term, 2 credits

A continuation of Course C. E. 9.

Six laboratory hours per week. Senior year.

11. ARCHES AND RETAINING WALLS

MR. BANKSON — Winter Term, 3 credits

Theory of arches; external forces; methods of failure by sliding, rotation, crushing. Methods of testing; stability, criteria of safety. Location of the line of resistance. Symmetrical and unsymmetrical loading. Curvature of linear arches. Rules and formulas derived from practice. Design of retaining walls, including dams and methods of failure. Theoretical and empirical formulas.

One recitation and six hours design per week. Senior year.

Pre-requisite: C. E. 8.

12. ROADS AND PAVEMENTS

MR. LAMBIE Spring Term, 3 credits

A study of the location, width and transverse section of roads and streets, together with a study of the materials used and methods of constructing or improving the surfaces of roads and pavements.

Two recitations and three hours laboratory per week. Senior year.

Pre-requisites: Geology 1; and Mechanics 3.

13. MUNICIPAL ENGINEERING

MR. LAMBIE Winter Term, 2 credits

The subject of water supply is taken up, dealing with the quantity required, the gauging of streams by means of floats, current meters, etc., computations to determine the necessary storage to insure a given supply, the design of standpipes, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of water.

Also the drainage of buildings and lands, the sewerage of cities and towns, the design of a sewerage system for a given district, and the study of the different methods of treatment and disposal of sewage.

One lecture and recitation, with three hours field work and designing per week. Senior year.

Pre-requisites: Mechanics 2 and 5.

14. MUNICIPAL ENGINEERING

MR. LAMBIE Spring Term, 2 credits

A continuation of Course C. E. 13.

One lecture and recitation and three hours design work per week. Senior year.

15. STRESSES IN TRUSSES, AND BRIDGE DESIGN

MR. BANKSON Spring or Summer Term, 5 credits

Methods of computing stresses in roof and bridge trusses. An account of the development of bridge building and the principles of economic design, followed by a complete analysis for the stresses of a roof truss, a plate girder bridge, a pin-connected bridge, and a critical study of other standard types. The varied forms of bridges in this vicinity, as well as the extensive bridge work here, offer exceptional opportunity to the student in this field of engineering activity. Supplemented by lectures. Junior year.

Five recitations and lectures per week.

Pre-requisites Mechanics 2 and 4.

16. STRUCTURAL ENGINEERING

PROFESSOR SMITH Fall Term, 4 credits

An elementary course in structural designing; including properties of rolled shapes of structural steel; structural shop methods; design and detailing of riveted joints, simple truss members, and minor trusses.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: Mechanics 4.

17. STRUCTURAL ENGINEERING

PROFESSOR SMITH Winter Term, 4 credits

Structural engineering as applied in general; and detail designs of various steel-framed structures, including mill buildings, highway bridges, and plate-girder railroad bridges. The work consists of the complete analysis and design of the structures under a given set of specifications, followed by the practice of making complete general and detail drawings, with stress sheets, weight and cost data, and bills of material.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisites: C. E. 15 and 16.

18. STRUCTURAL ENGINEERING

PROFESSOR SMITH Spring Term, 4 credits

A study of pin-connected bridge trusses of the various types. The work includes the general design and determination of stresses; the detail design and detail drawings of the structure, with stress sheets, weight and cost data.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: C. E. 17.

19. CURRENT ENGINEERING TOPICS

1 credit per term

The object of this course is to increase the student's knowledge of engineering practice as well as to train him in the presentation and discussion of themes in general. Instructors and students of all classes meet on equal terms.

The work consists of original papers, reviews, and general discussions on subjects pertaining to science and engineering.

One session hour per week. Sophomore, Junior, and Senior years.

Open to all students.

20. INSPECTION VISITS AND REPORTS

PROFESSOR SMITH 1 credit per term

One afternoon in each alternate week is spent in the large industrial plants or at the site of one of the notable engineering structures of the Pittsburgh district. A separate report dealing with the technical details of the inspection is required for each visit. Senior year.

Pre-requisites: C. E. 6 and 15.

21. THESIS

PROFESSOR SMITH Winter and Spring Terms, 3 credits each term

For the degree of B. S., in Civil Engineering, a thesis involving a large amount of original work in engineering must be presented in acceptable form and approved by the head of the department several days in advance of the date of graduation. The subject must be decided upon at a time not later than the ninth term of the student's course.

Mechanical Engineering

(1a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Fall Term, 3 credits

The elementary study of casting design from the standpoint of moulding and founding. The student is required to mould a graded set of patterns, run off heats, and cast a number of representative test specimens from various metals. The lecture and recitation work covers the study of the properties of castings and the production of same on a commercial scale. Inspection trips are made to local foundries.

One lecture or recitation and six hours elementary laboratory work per week. Freshman year.

(2a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Winter Term, 3 credits

The elementary study of the treatment and properties of wrought iron, soft steel, and carbon tool steel. The student is required to forge and machine a number of representative test specimens which will bring out the characteristics and strength of materials. The lecture and recitation work covers the study of the properties of wrought metals, and the working and forging of same on a commercial scale. Inspection trips are taken to local industrial plants.

One lecture or recitation and six hours elementary laboratory work per week. Freshman year.

(3a) ELEMENTARY MECHANICAL LABORATORY..

MR. WEBER AND ASSISTANTS Spring Term, 3 credits

Machine elements and structural details are prepared and tested, and the results reported. The lecture and recitation work includes the discussion of the results of laboratory tests and the study of the elementary features of machine and structural design.

One lecture or recitation and six hours elementary laboratory work per week. Freshman year.

(4a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Summer or Fall Term, 2 credits

A continuation of 3a together with the heat treatment of various carbon and high speed tool steels, case-hardening, etc.

One lecture or recitation and three hours elementary laboratory work per week. Sophomore year.

(5a) PROCESSES OF MANUFACTURE

MR. WEBER Winter or Spring Term, 3 credits

The study of up-to-date processes of manufacture, by means of visits of inspection each alternate week accompanied with lectures and reference and text book study.

Two lectures or recitations and three hours visiting or reporting per week. Sophomore year.

(6a) COSTS

MR. WEBER Summer Term, 3 credits

The study of costs with a view to familiarize the student with current prices of materials, cost of production, and the working up of a representative system of cost keeping for a manufacturing plant.

One lecture or recitation and six hours for estimating and cost keeping per week. Sophomore year.

1. KINEMATICS

ASSISTANT PROFESSOR RICHARDSON Fall or Winter Term, 3 credits

A study of the principles underlying the action of machine elements; the communication of motion by trains of gearing, pulleys, and belts; cams and link work; the different forms of gear teeth; automatic feed motions; quick return motions, etc.

Two recitations and three drawing hours per week. Junior year.

Pre-requisites: Graphics 5; Mathematics 10.

2. MACHINE DESIGN AND DRAWING

ASSISTANT PROFESSOR RICHARDSON Spring or Summer Term, 4 credits

The proportioning of machine elements, such as shafting, pulleys, cranks, gears, cylinders, and frames. The knowledge thus gained is applied in the complete design of machines to fulfill certain requirements.

Two recitations and lectures and six drawing hours per week. Junior year.

Pre-requisites: Graphics 5; Mechanics 2; M. E. 1.

3. MACHINE DESIGN AND DRAWING

ASSISTANT PROFESSOR RICHARDSON Fall Term, 3 credits

Continuation of Course M. E. 2.

One recitation and lecture and six drawing hours per week. Senior year.

4. PRIME MOVERS

ASSISTANT PROFESSOR RICHARDSON Spring or Summer Term, 3 credits

A brief study of the construction and operation of steam boilers, engines and turbines; and of gas engines and producers.

Two lectures and three laboratory hours per week. Junior year.

Pre-requisites: Mechanics 1; Physics 13.

5. THERMODYNAMICS

PROFESSOR STEWART Fall Term, 4 credits

A study of the general principles of energetics, the cycle, the thermal properties of matter, the steam engine cycle, the laws of gases, gas-engine cycles, refrigerating-machine cycles, and the thermal modifications of the theoretical cycle in actual steam and gas engines. The object of this course is to prepare the student for courses in steam-engine design, gas engines, compressed air, refrigerating machinery, and motor cars.

Four lectures and recitations per week. Senior year.

Pre-requisites: Mathematics 10; Physics 15.

6. COMPRESSED-AIR MACHINERY

ASSISTANT PROFESSOR RICHARDSON Winter Term, 2 credits

A study of the physical properties of air, its isothermal and adiabatic compression and expansion, single and multiple-stage compression, and the principal types of air compressors. Visits are made for the purpose of enabling the student to see the practical working of compressed air machinery.

One lecture per week. Senior year.

Pre-requisites: M. E. 3 and 5.

7. MOTOR CARS

PROFESSOR STEWART Winter Term, 2 credits

This course covers a study of the construction, operation and design of modern motor cars as follows: (1) The power-plant, including gasoline motor, carburetor, ignition system, motor cooling and lubrication. (2) The transmission, including cone and multiple-disc clutches, speed-change and reverse gears, chain, bevel-gear and worm drives, differential, semi and full-floating axles and brakes. (3) Front axles, steering mechanism, and control. (4) Frame, springs, and body. (5) Road wheels, quick detachable and demountable wheel-rims, and tires. (6) Care of car, road-rules, and how to drive. (7) Motor-trucks.

Frequent visits are made to garages and motor-car repair shops for the purpose of studying construction details and operation.

One lecture, and either three hours of drawing or laboratory per week. Senior year.

Pre-requisites: Physics 15; Chemistry 8, M. E. 3 and 5.

8. STEAM BOILERS

PROFESSOR STEWART Winter Term, 3 credits

A study of the principal types of steam boilers, the design of the different structural details, the proportioning of a boiler of given type and horse-power, and the design of boiler accessories. Lectures on shop practice in boiler construction and visits of inspection to boiler and other plate metal shops. A study of fuels and furnaces used in the generation of steam, and of machinery for handling coal and ash.

Two lectures and three drawing hours per week. Senior year.

Pre-requisites: Physics 15; Chemistry 8; M. E. 3 and 5.

9. STEAM ENGINES

ASSISTANT PROFESSOR RICHARDSON Winter Term, 3 credits

A study of indicator cards, entropy-temperature and crank-effort diagrams for the best known types of simple and compound engines; also the design of engine details, such as crank shafts, crank pins, connecting rods, pistons, valve gears, governors and fly-wheels. Lectures are given on shop practice in engine construction, and visits of inspection are made to study engines in process of construction and to steam power plants to study them while in operation.

One lecture and six drawing hours per week. Senior year.

Pre-requisites: M. E. 3 and 5.

10. STEAM TURBINES

ASSISTANT PROFESSOR RICHARDSON Spring Term, 3 credits

A study of the theory of steam turbines and of the constructive details of the types most commonly in use for the generation of power. Visits of inspection are made to local plants to study turbines in the process of construction and in operation.

Three lectures and recitations per week. Senior year.

Pre-requisites: M. E. 3 and 5.

11. GAS ENGINES AND PRODUCERS

PROFESSOR STEWART Spring Term, 3 credits

A study of modern gas engines and of the production of gas for motive power. A study is made of typical gas-engine details, after which, the principal computations and drawings are made for a gas engine of given type and horse-power. Visits are made to see gas engines under process of construction and to see them operating.

Two recitations and lectures and three drawing hours per week. Senior year.

Pre-requisites: Physics 15; Chemistry 8; M. E. 3 and 5.

12. POWER-PLANT ENGINEERING

ASSISTANT PROFESSOR RICHARDSON — **Spring Term, 3 credits**

A study of the selection and proportioning of the essential details of a power-plant. Lectures are given on location of plant, type of power house, foundations for engines and chimneys, and visits of inspection are made to a number of representative power-plants to enable the student to study their practical operation, and, when opportunity affords, visits are made to see power-plants in process of construction.

Two lectures and three drawing hours per week. Senior year.

Pre-requisites: M. E. 8, 9, 10, and 11; E. E. 5.

13. STEAM LABORATORY

ASSISTANT PROFESSOR RICHARDSON — **Winter Term, 2 credits**

The testing and calibration of pressure and vacuum gauges, steam-engine indicators; planimeters, etc.; indicator and dynamometer power measurements, valve-setting, and determination of mechanical efficiency of engines; test of auxiliary apparatus, etc. ,

Six laboratory hours per week. Senior year.

Pre-requisites: Physics 15; M. E. 4 and 5.

Taken concurrently with M. E. 8 and 9.

14. POWER-PLANT TESTING

ASSISTANT PROFESSOR RICHARDSON — **Spring Term, 1 credit**

Capacity and efficiency tests of steam and gas-engine power-plants, together with complete reports on same. These tests as far as practicable will be conducted upon recently constructed power plants. The time allotted to this course, while somewhat variable, will approximate the equivalent of three laboratory hours per week. Senior year.

Pre-requisites: Physics, 15; Chemistry, 8; M. E., 4, 5, 8, and 9; Taken concurrently with M. E. 10, 11 and 12.

15. MANUFACTURE AND PROPERTIES OF IRON AND STEEL

PROFESSOR STEWART — Spring Term, 3 credits

A study of (1) the Bessemer process, the theory and construction of gas producers, the open-hearth or Siemens process, and the production of steel castings; (2) the mechanical treatment of steel, including a study of the five leading types of rolling-mills, and the three processes for the manufacture of steel tubes; (3) the heat treatment of steel. Visits of inspection, on which reports are required, are made to a number of the great steel and tube mills in the vicinity of Pittsburgh.

Two lectures and either three hours laboratory or one afternoon inspection trip per week. Senior year.

Pre-requisites: Chemistry 8; M. E. 4; E. E. 5.

16. INSPECTION VISITS AND REPORTS

PROFESSOR STEWART AND ASSISTANT PROFESSOR RICHARDSON

1 credit each term

Visits of inspection are made to shops, mills, factories, and power plants.

The University, being located in a vast field of industrial activity, probably the most extensive of its kind in the world, affords the student a rare opportunity for studying practical engineering in all its varied forms. After each visit the class meets with the instructor for conference and discussion. The student then prepares and submits a report, which not only provides him with a record of useful data, but also gives him an excellent exercise in technical composition.

The equivalent of one afternoon each alternate week. Senior year.

17. CURRENT ENGINEERING LITERATURE

PROFESSOR STEWART AND ASSISTANT PROFESSOR RICHARDSON

1 credit each term

This course consists of written reviews and discussions of the current engineering literature pertaining to engineering practice.

One hour session each alternate week, together with outside readngs and written reviews.

18. THESIS

PROFESSOR STEWART AND ASSISTANT PROFESSOR RICHARDSON

Winter and Spring Terms, 3 credits each term

The subject must be chosen and presented to the head of the department for approval during the latter part of the Fall term, Senior year.

This work will generally consist of the following: (1) the preparation of a bibliography of the important literature on the subject chosen; (2) the student's own investigations and deductions; and (3) the preparation of the thesis proper.

The thesis must be delivered in its final bound form to the head of the department not later than one week before date of Commencement.

Electrical Engineering

1. DYNAMO-ELECTRIC MACHINERY

ASISTANT PROFESSOR HARRIS Fall or Winter Terms, 5 credits

A study of the fundamental principles of electricity and magnetism and their application to direct-current machinery.

Five lectures and recitations per week. Junior year.

Pre-requisites: Physics 13.

2. APPLIED ELECTRICITY

MR. LELICH Fall or Winter Term, 3 credits

This is a short course designed to meet the requirements of those not specializing in Electrical Engineering.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

3. APPLIED ELECTRICITY

ASSISTANT PROFESSOR HARRIS Fall or Winter Term, 3 credits

This course is similar to E. E., 2; but more comprehensive in scope. Designed with special reference to the needs of Mechanical Engineering students.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

4. APPLIED ELECTRICITY

ASSISTANT PROFESSOR HARRIS Spring or Summer Term, 3 credits

A continuation of Course E. E. 3.

Two lectures and recitations and three hours laboratory per week. Junior year.

5. APPLIED ELECTRICITY

ASSISTANT PROFESSOR HARRIS Fall Term, 3 credits

A continuation of Course E. E. 4.

Two lectures and recitations and three hours laboratory per week. Senior year.

6. ALTERNATING-CURRENT THEORY

ASSISTANT PROFESSOR HARRIS Spring or Summer Term, 3 credits

This course consists of a mathematical and graphical treatment of periodic functions as exemplified in alternating currents with the attendant phenomena of inductance, capacity, etc., singly and in combination.

Three lectures and recitations per week.

Pre-requisites: E. E. 1; and Mathematics 11.

7. ALTERNATING-CURRENT MACHINERY

MR. LEILICH Fall Term, 3 credits

A mathematical and graphical treatment of alternating-current phenomena as applied to electrical machinery. A study is made of the different types of generators, motors, cynchnonous converters, etc.

Three lectures and recitations per week.

Pre-requisite: E. E. 6.

8. ALTERNATING-CURRENT MACHINERY
MR. LEILICH Winter Term, 3 credits

A continuation of Course E. E. 7.

Three lectures and recitations per week. Senior year.

9. ALTERNATING-CURRENT MACHINERY
MR. LEILICH Spring Term, 3 credits

A continuation of Course E. E. 8.

Three lectures and recitations per week. Senior year.

10. GENERAL ELECTRICAL ENGINEERING
ASSISTANT PROFESSOR HARRIS Fall Term, 3 credits

This course is designed to cover the enginering and economic phases of the more special branches of Electrical Engineering, such as electric traction, electric transmission of power, etc.

Three lectures and recitations per week. Senior year.

Pre-requisite: E. E. 6.

11. GENERAL ELECTRICAL ENGINEERING
ASSISTANT PROFESSOR HARRIS Fall Term, 3 credits

A continuation of Course E. E. 10.

Three lectures and recitations per week. Senior year.

12. GENERAL ELECTRICAL ENGINEERING
ASSISTANT PROFESSOR HARRIS Spring Term, 3 credits

A continuation of Course E. E. 11.

Three lectures and recitations per week. Senior year.

13. ELECTRICAL ENGINEERING DESIGN
PROFESSOR KINTNER Fall Term, 4 credits

This course is intended to give the student practice in the application of the fundamental theory of electricity and magnetism to the calculation and proportioning of electrical machinery. A portion of the time is devoted to the study of the materials entering into electrical construction.

Two lectures and six hours in design room per week. Senior year.

Pre-requisite: E. E. 1.

14. ELECTRICAL ENGINEERING DESIGN
PROFESSOR KINTNER Winter Term, 4 credits

A continuation of Course E. E. 13.

Two lectures and six hours in design room per week. Senior year.

15. ELECTRICAL ENGINEERING LABORATORY
ASSISTANT PROFESSOR HARRIS Fall or Winter Term, 1 credit

This course is designed to furnish an experimental basis for the theory given in Course E. E. 1. It consists largely of elementary direct current machine tests.

Three hours laboratory per week. Junior year.

Pre-requisite: Registration in Course E. E. 1.

16. ELECTRICAL ENGINEERING LABORATORY

MR. LEILICH Spring and Summer Terms, 1 credit

An experimental study of alternating current circuits, supplementing Course E. E., 6; with special reference to the effect of inductance and capacity, singly or in combinations. The measurement of alternating current single and polyphase power, and the determination and analysis of wave forms constitutes a portion of the work.

Three hours laboratory per week. Junior year.

Pre-requisite: Registration in Course E. E. 6.

17. ELECTRICAL ENGINEERING LABORATORY

MR. LEILICH Fall Term, 2 credits

Advanced direct and alternating current testing of generators, motors, transformers, converters, rectifiers, etc., both commercial and for the purpose of investigation.

Six hours laboratory per week. Senior year.

Pre-requisite: Registration in Course E. E. 7.

18. ELECTRICAL ENGINEERING LABORATORY

MR. LEILICH Winter Term, 2 credits

A continuation of Course E. E. 17.

Six hours laboratory per week. Senior year.

19. ELECTRICAL ENGINEERING LABORATORY

MR. LEILICH Spring Term, 2 credits

A continuation of Course E. E. 18.

Six hours laboratory per week. Senior year.

20. ELECTRICAL ENGINEERING SEMINAR

ASSISTANT PROFESSOR HARRIS AND MR. LEILICH

Three terms, 1 credit each term

The student and instructors meet regularly to discuss current engineering topics of interest. A part of the time is devoted to reviews and to reports and discussions of thesis matter by the Seniors.

One hour per week. Senior year.

Open to all students in Electrical Engineering.

21. INSPECTION VISITS AND REPORTS

ASSISTANT PROFESSOR HARRIS Three terms

Frequent visits of inspection are made to the numerous manufacturing establishments, both electrical and mechanical, in this vicinity. The

University is unusually fortunate in being located in this great manufacturing center, where the student sees the principles which he studies in the department daily put into practical operation. Among the many large electrical establishments accessible to the technical students, especial benefit is derived from the great Westinghouse works, to which the classes are welcomed visitors at any time.

These visits of inspection are required of all Seniors in the Electrical Engineering Department.

22. Electrical Engineering Thesis

5 credits

A thesis is required of all candidates for the degree of B. S. in Electrical Engineering. This will consist of a report on original investigations and is intended to demonstrate the student's ability to think and act along independent lines. The subject must be approved by the professor in charge by January 15th prior to Commencement and an outline of the results desired and method to be employed approved not later than April 1st.

Sanitary Engineering

1. Hydro-Mechanics and Hydraulics

Mr. Lambie — Spring or Summer Term, 4 credits

The equilibrium and pressure of liquids; the motion and work of fluids; the flow of water through orifices, over weirs, in pipes, and in canals; measurement of water power; and hydraulic machinery.

Four recitations and lectures per week. Junior year.

Pre-requisites: Mechanics 1, Mathematics 10.

2. Hydraulic Laboratory

Assistant Professor Richardson — **Spring or Summer Term, 1 credit**

The experimental study of the flow of water through pipes, nozzles, orifices, and over weirs. Capacity and efficiency tests of hydraulic turbine pumps and motors.

Three laboratory hours per week. Junior year.

To be taken concurrently with S. E. 1.

3. Water Examination

Dr. Phillips — Spring or Summer Term, 3 credits

See outline of course under Chem. 34.

One lecture and six laboratory hours per week. Junior year.

Pre-requisites: Chemistry 9-10-11.

4. Laboratory Methods

Dr. Wallgren — Fall Term, 2 credits

See outline of course under Biology 20.

To be taken concurrently with advanced Bacteriology. Senior year.

5. HEATING AND VENTILATION

MR. LAMBIE Winter Term, 2 credits

A series of lectures dealing with the various systems and the fundamental mechanical principles involved in their application and design. Senior year.

6. SANITATION OF BUILDINGS

DR. WALLGREN Winter Term, 2 credits

See outline of course under Biology 22.

To be taken concurrently with S. E. 5. Senior year.

7. WATER SUPPLY ENGINEERING

MR. LAMBIE Winter Term, 2 credits

The subject of municipal supply is taken up, dealing with the quantity required and the source of supply, the design of stand pipes, reservoirs, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of the water. Visits of inspection to various plants in the vicinity are made during the term.

One lecture and three hours designing per week. Senior year.

Pre-requisites: Mechanics 2, S. E. 1.

8. SEWERAGE AND SEWAGE DISPOSAL ENGINEERING

MR. LAMBIE Spring Term, 2 credits

The drainage of lands, the sewerage of cities and towns, the laws governing the disposal of sewage, and a study of the various systems of sewage treatment.

One lecture and three hours designing per week. Senior year.

Pre-requisites: Mechanics 2, S. E. 1.

9. MUNICIPAL SANITATION

DR. WALLGREN Spring Term, 3 credits

See outline of course under Biology 23.

One lecture and four laboratory hours per week. Senior year.

To be taken in conjunction with S. E. 7 and 8.

10. HYDRAULIC AND SANITARY ENGINEERING DESIGN

MR. LAMBIE Winter Term, 3 credits

The design of structures connected with sanitary engineering, the development of water power, and irrigation projects, and supplementing course S. E. 7.

One lecture or recitation and six hours designing per week. Senior year.

Pre-requisites: S. E. 1, S. E. 3, C. E. 8.

11. HYDRAULIC AND SANITARY ENGINEERING DESIGN

MR. LAMBIE — Spring Term, 2 credits

A continuation of course S. E. 10, supplementing S. E. 8.

One lecture or recitation and three hours designing per week.

12. CURRENT TOPICS

PROFESSOR KNOWLES AND MR. LAMBIE — 1 credit per term

Prepared presentation and discussion of various engineering and scientific problems of the day, particularly those pertaining to the public health.

Students and instructors meet on equal terms.

One hour per week. Junior and Senior years.

13. VISITS OF INSPECTION

PROFESSOR KNOWLES AND MR. LAMBIE

Visits to various industrial plants, sanitary works, and engineering projects under construction. Reports covering each visit in detail are required.

One afternoon of each alternate week. Senior year.

14. SANITARY ENGINEERING PRACTICE

PROFESSOR KNOWLES

Fall, Winter and Spring Terms, 1 credit each

Discussion of the various aspects of current day sanitary problems as they present themselves to the practical engineer. Accompanied by assigned readings and reports.

One hour per week. Senior year, 3 terms.

15. THESIS

PROFESSOR KNOWLES AND MR. LAMBIE

Winter and Spring terms, total 7 credits

All candidates for the degree of B. S. in S. E. must prepare a thesis embodying a large amount of original design or research in some branch of their profession.

ECONOMICS

3 E. ECONOMICS

ASSISTANT PROFESSOR CRAFER — Fall or Winter Term; 3 credits

A brief resume of economic theory. Discussion of practical economic problems; wages, interest, rent, currency, banking, taxation, trusts, tariff, socialism.

Open only to Engineering and special students.

Text-book and lectures.

10, 11. TRANSPORTATION

MR. FLOCKEN Fall and Winter Terms; 2 credits each term

The origin and growth of the American railways. Their present ownership and control. The organization of the railway company, and how it does its work. Railway financiering. The freight, passenger, express and mail service. Railway abuses. Regulation by the States and by the Federal Government. The Interstate Commerce Commission. Government ownership in the light of foreign experince. Railway rates and fares. Electric railway transportation. Ocean transportation. Ocean highways and seaboard terminals. The organization of ocean freight, passenger, express and mail service. The merchant marine. The question of subsidies. The river, lake and canal systems of the United States. The increasing importance of the inland waterways question. Text-book, lectures and assigned readings. Text-book, Johnston's *Elements of Transportation.*

13. MODERN INDUSTRIES

MR. FLOCKEN Fall Term; 2 credits

A study of the leading American industries, physiographic control, sources and supply of raw material, agricultural resources. Factors affecting the location of industry. Sources and application of power. Manufacturing methods, and factors affecting cost of production. Large scale versus small scale production. Internal commerce and foreign trade. Lectures, assigned readings and reports.

16. INDUSTRIAL MANAGEMENT

MR. FLOCKEN Winter Term; 2 credits

Advantages of various methods of business organizations and management. The internal management of the large business or plant and the differentiation of the duties of various departments. Profit-sharing schemes. Labor problems. Markets and methods of distribution. A study of actual industrial conditions by visits to the mills and shops of Pittsburgh, special attention being given to the handling of raw material, the arrangement of plant, and shipping facilities. Lectures, assigned readings, reports, field work.

21. CORPORATION FINANCE

PROFESSOR HOLDSWORTH Fall Term; 2 credits

Types of business corporations. The genesis of the trust. The financial organization and management of the corporations. The promoter and the underwriting syndicate. The disposition of gross earnings and the provision of new capital. Charter, articles and by-laws. Stockholders' powers, rights and liabilities. Dissoluton, receiverships and reorganizations. Lectures and text-book, assigned readings and reports. Text-books, Lough's *Corporation Finance.*

24. INVESTMENTS

PROFESSOR HOLDSWORTH — Winter Term; 2 credits

The general characteristics and merits of government and municipal bonds, and of railway, industrial, public service corporation, power and irrigation securities. The farm and city mortgage. How securities are purchased and marketed. The organization of the investment business. A study of fluctuations in bond and stock prices to determine the influence acting upon security values. Analysis of typical securities and railroad reports. Examination of savings banks and trust company holdings. Lectures, assigned readings, and reports.

46. CONTRACTS AND SPECIFICATIONS ,

ASSISTANT PROFESSOR CRAFER — Spring Term; 3 credits

In this course are presented the essential elements of a contract, the law pertaining thereto and parties who may contract. The consideration, discharge and remedies for breach of contract. Forms of proposals, specifications and illustrative examples of complete contracts and specification for various engineering projects are given.

MATHEMATICS

5. PLANE TRIGONOMETRY

MR. DYCHE AND MR. ALBERT — Fall Term, 3 credits

The subjects treated are the functions of angles, goniometry, trigonometric equations, solution of right and oblique triangles, with emphasis upon solution of examples of all kinds, involving both theory and practical applications.

Freshman year.

6, 7, 8, 9, 10.

DR. WENRICH, MR. DYCHE AND MR. ALBERT

Fall Term; 2 credits
Freshman Year, Winter Term; 5 credits
Spring Term; 5 credits
Sophomore Year, Summer or Fall Term; 4 credits
Winter or Spring Term; 4 credits

This is a course in Mathematics for students in Engineering and applied science as presented in Woods & Bailey's text.

Advanced Algebra, Analytical Geometry, Differential and Integral Calculus are combined in this one treatise.

The course extends throughout the Freshman year and terminates at the end of the second term of the Sophomore year.

13. DIFFERENTIAL EQUATIONS

MR. LEHLICH — Junior Year, Fall Term; 2 credits

Ordinary differential equations.

A short course required of electrical engineering students.

PHYSICS

11, 12, 13. GENERAL PHYSICS

PROFESSOR BISHOP, MR. DYCHE AND MR. ALBERT

Fall, Winter, Spring and Summer Terms, 5 credits each term

The subjects covered in this course are the same as those in 1, 2, 3. but the calculus is extensively employed and special attention is given to the physical interpretation of mathematical equations.

A series of twelve lectures on the precision of measurements is given in connection with the laboratory work. Special attention is given in the laboratory to the method of the experiment and to the precision of the results.

Concurrent with Mathematics 9 and 10.

Required of all Engineering students. Sophomore year.

14, 15, 16. ADVANCED PHYSICAL LABORATORY

DR. WENRICH — Fall, Winter. Spring and Summer Terms

This course deals primarily with electrical measurements but includes experiments in measurement of high temperature, calorific power of fuels, and photometry. The experiments for each student are assigned according to the course he is pursuing.

Pre-requisite, Physics 11, 12, 13.

30, 31. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM

DR. WENRICH — Tenth and Eleventh Terms, 3 credits each term

A rigid Mathematical treatment of electricity and magnetism, including a study of Hertz's experiments and the present day theory of electro-magnetism.

Three lectures and recitations per week.

Pre-requisites, Mathematics 13.

CHEMISTRY

3, 4. GENERAL INORGANIC CHEMISTRY

DR. VOGT AND ASSISTANTS

Fall and Winter Terms, 4 credits each term

One lecture, one quiz and six laboratory hours per week. This course includes the same general topics as 1, 2, but more attention is given to chemical calculations and to the technical applications of chemistry. Required in the Chemical course and in all Engineering courses of all students not having entrance credit in Chemistry.

5, 6. GENERAL INORGANIC CHEMISTRY
DR. VOGT AND ASSISTANTS

Fall and Winter Terms, 3 credits each term

One lecture, one quiz and three laboratory hours per week. A more advanced course in general inorganic chemistry for students who have had chemistry in preparatory schools. Required in the chemical course and in all Engineering courses of all students who have entrance credit in Chemistry. Elective in other courses.

8. QUALITATIVE ANALYSIS
ASSISTANT PROFESSOR SILVERMAN, DR. VOGT, MR. H. CLARK, MR. C. W. CLARK, MR. HOBBS, MR. BLAKE, MR. MYER

Spring Term, 4 credits

This course consists of two lectures or recitations and six laboratory hours a week. The work includes the study of the reactions of bases and acids and the analysis of simple compounds and mixtures.

Pre-requisites, Courses 3, 4 or 5, 6.

Required in the Chemical course, in Group IV and V and in all Engineering courses. Elective in other courses.

9, 10, 11. QUANTITATIVE ANALYSIS
ASSISTANT PROFESSOR SILVERMAN AND MR. PRATT

Fall, Winter and Spring Terms, 3 credits each term

This course consists of one lecture and six laboratory hours weekly, and includes a general study of the simpler methods for the determination of the commonly occurring elements and radicals, and also the complete analysis of various minerals.

Pre-requisite, Course 8.

Required in Chemical and Sanitary Engineering courses.

12, 13, 14. QUANTITATIVE ANALYSIS
ASSISTANT PROFESSOR SILVERMAN

Fall, Winter and Spring Terms, 3 credits each term

For the completion of this course one lecture and six laboratory hours a week are required. The work includes complete analysis of minerals, ores, iron and steel, cements and alloys.

Pre-requisites, Courses 9, 10, 11.

Required in Chemical Engineering.

15. ORGANIC CHEMISTRY
PROFESSOR PHILLIPS Fall, Winter and Spring Terms, 4 credits each term

This course consists of two lectures or recitations and six hours of laboratory throughout the year. The subject is taught in an elementary way and deals with the constitution, preparation and properties of the typical compounds of the fatty and benzene series. The laboratory work includes practice in synthetical methods.

Required in Chemical Engineering.

22, 23. PHYSICAL CHEMISTRY

DR. VOGT Winter and Spring Terms, 3 credits each term

A general course in the theories of chemistry. Pre-requisites, Courses 3-5, 15-17.

27, 28, 29. TECHNICAL CHEMISTRY

PROFESSOR PHILLIPS Fall, Winter and Spring Terms, 3 credits each term

Lectures upon the chemistry of manufacturing operations, having reference especially to chemical industries in the Pittsburgh region. Visits are made to the various chemical works in the vicinity, attendance upon which is required.

Required in Chemical Engineering.

BIOLOGICAL SCIENCES

3. GENERAL BIOLOGY. BRIEFER COURSE

PROFESSOR FETTERMANN AND ASSISTANTS

Spring or Summer Terms, 3 credits

This course is designed to meet the needs of engineering students. During the first half of the course attention is given to the study of animal forms, including classification, distribution, habits, etc. The remainder of the term is given to the study of the morphology, classification and distribution of plants.

One lecture and four laboratory hours each week.

17, 18. BACTERIOLOGY

PROFESSOR FETTERMANN Fall and Winter Terms, 4 credits each term

This course is intended for students taking regular courses in Biology, and also those who may elect the work in Sanitary Engineering. Students are expected to become familiar with the methods of detection, isolation, and identification of various micro-organisms. Lectures are given on the classfication, morphology, structure, reproduction and cultural characteristics of bacteria. Instruction is given on the principles of sterilization and disinfection, special emphasis being laid upon their practical application. In the latter part of the course special attention is given to the study of the bacteria occurring in soil, water and milk. The manner in which bacteria produce disease and the production of immunity are explained. Text-books: Jordan; Abbott; Muir, and Ritchie.

One lecture and six hours laboratory each week.

19. ADVANCED BACTERIOLOGY

PROFESSOR FETTERMANN Spring Term, 4 credits

One lecture and six hours laboratory each week.

This course is the continuation of Course 18. The object is to impart a practical knowledge of the bacteriology of water, milk and sewage.

Bacteria are studied in their relation to the dairy industry, and water supply, and also with reference to the part they play in the purification of sewage.

PSYCHOLOGY

4. General Psychology for Engineering Students

Professor White — One Term, 3 credits

This is an introduction to the study of human nature and the psychical forces behind material progress. Emphasis will be placed upon such problems as individual differences of character and intelligence, their causes and significance; the fundamental instincts, imitation, competition, co-operation; the many social relationships, suggestion, habit, memory, constructive imagination, the emotions, reason, will, etc. Required in the Engineering courses.

GEOLOGY

Geol. 1. General Geology

Summer Term, 5 hours, 3 credits.

Geol. 6. Structural and Field Geology

Winter or Spring Term, 3 hours, 3 credits.

MINERALOGY

Min. 1. Crystallography and Mineralogy

Fall or Winter Term, 6 hours, 2 credits.

ASTRONOMY

The undergraduate courses in Astronomy at present given are the following. for graduate courses see Graduate School.

1. General Astronomy

Assistant Professor Jordan — Second Semester, 2 hours

A course in Descriptive Astronomy, based upon Moulton's text-book. Required in C. E. course. Junior year.

ENGLISH LANGUAGE AND LITERATURE

Four hours a week. Fall and Winter Terms.

English 4 and 5. English Composition

Mr.

A study of the principles of composition, written and oral, with especial reference to exposition. Practice in writing and speaking; analysis of specimens of technical and scientific exposition.

Text-book: Earle's *Technical Writing.*

Required of Freshmen in the School of Engineering.

English 6. English Composition

Mr.

A continuation of courses 3 and 4, the practice in oral composition being discontinued.

Three hours a week. Spring Term.

Required of Freshmen in the School of Engineering.

7. Argumentation and Debating

Professor Gibbs and Mr. ...... Fall and Winter Terms, each 3 credits

The theory of argumentation, with practical exercises in brief-drawing and the composition and delivery of forensics.

Elective for students who have taken Courses 1, 2, 3 or 4, 5, 6. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15.)

15. English Literature

Professor Gibbs Winter Term, 3 credits

A study of selected masterpieces representing the successive periods of English literature, with a text-book to furnish a historical background and connections.

Required of Sophomores. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15. For their benefit both courses will be offered in the Fall and Summer terms.)

GERMAN LANGUAGE AND LITERATURE

1, 2, 3. Elementary German

Professor Berger Fall, Winter and Spring Terms, 3 credits each term

Elements of grammar and the reading of easy texts. Vos, *Essentials of German;* Hewitt's *German Reader;* Simple lyrics and ballads memorized. Gerstaecker, *Germeythausen;* Baumbach, *Der Schwiegersohn.*

Open to Freshmen who have satisfied requirements for admission by offering French or Latin if they wish to take up German as the required modern language. Elective for Sophomores.

4, 5, 6. Intermediate Course

Professor Berger Fall, Winter and Spring Terms, 3 credits each term

Review of Grammar. Drill in translating from English into German and practice in conversation. Memorizing of simple prose and poetry. Wesselhoeft: *German Exercises.* Wenckebach: *German Composition.* Wildenburch: *Des edle Blut.* Gerstacker: *Irrfahrten.* Hatfield: *German Lyrics and Ballads.*

Classical German Authors. Selections from the following lists of texts: Schiller: *Maria Stuart.* Gœthe: *Hermann und Dorothea;* Lessing:

Minna von Barnhelm. German is used extensively in conducting class work.

Required of all Freshmen satisfying entrance requirements in German who elect to continue it.

7, 8, 9. TECHNICAL GERMAN

Summer or Fall Terms, 3 credits each term
Winter or Spring Terms, 3 credits each term
Summer Term, 3 credits

Syntax. Prose Composition, conversation. Freytag: *Soll und Haben, Aus dem Jahrhundert des grossen Krieges.* Whitefield and Kaiser: *A Course of Commercial German.*

Required of all Sophomores in Engineering courses, who elect. German in Freshman year, having satisfied entrance requirements in this language. Elective for students who have taken previous courses.

ROMANCE LANGUAGES AND LITERATURES

1, 2, 3. ELEMENTARY FRENCH

PROFESSOR HARRY Fall, Winter and Spring Terms, 3 credits each term

Grammar, composition and easy reading, with thorough drill in pronunciation and practice in speaking.

Open to Freshmen who have satisfied requirements for admission by offering German or Latin, if they wish to pursue French as the required modern language.

4, 5, 6. INTERMEDIATE FRENCH

PROFESSOR HARRY Fall, Winter and Spring Terms, 3 credits each term

Extensive reading in selected works of Modern French writers. Fraser and Squair's Grammar completed. Advanced prose composition. French conversation. The following texts are read: Daudet, *Contes Choisis;* Maupassant, *Contes;* Coppee, *On Rend l'Argent;* Augier, *Le Gendre de M. Poirer;* George Sand, *La Mare au Diable;* Canfield; French Lyrics.

Required of all Freshmen satisfying entrance requirements in French who elect to continue it.

7, 8, 9. TECHNICAL FRENCH

PROFESSOR HARRY Summer or Fall Term, 3 credits each term
Winter or Spring Term, 3 credits each term
Summer Term, 3 credits

Herdler's Scientific Reader and other works of similar character will be read. The purpose of this course is to enable students to use Scientific French readily and is primarily designed for students in Engineering courses who have a good reading knowledge of ordinary French prose.

30, 31, 32. ELEMENTARY SPANISH

Fall, Winter and Spring Terms, 3 credits each term

Hill's and Ford's Spanish Grammar, reading, composition, conversation. Bransby's *Spanish Reader;* Selga's *La Mariposa Blanca;* Galdo's *Dona Perfecta; Tamayo Lo Positivo;* Giese's *Spanish Anecdotes.*

35, 36, 37. COMMERCIAL SPANISH

Fall, Winter and Spring Terms, 3 credits each term

Reading of Commercial Spanish. Commercial correspondence. Conversation. The vocabulary of every day life is emphasized.

40, 41, 42. ELEMENTARY ITALIAN

MR. MUSSO Fall, Winter and Spring Terms, 3 credits each term

Elementary grammar, dictation, reading, memorizing, conversation, and easy composition. Motti's Elementary Italian Grammar. Cattaneo, Italian Reader. DeAmicis, Cuore. Other selections from modern authors will be assigned by the instructor.

43, 44, 45. ITALIAN, INTERMEDIATE COURSE

MR. MUSSO Fall, Winter and Spring Terms, 3 credits each term

Study of Italian Grammar in Italian. Conversation and advanced prose composition. Italian literature of the XVIII and XIX centuries. Selected readings and brief lectures in Italian. Manzoni, I Promessi Sposi, will be read in full.

Open to students who have taken the course in Elementary Italian.

ALUMNI REGISTER

OF THE

SCHOOL OF ENGINEERING

OF THE

UNIVERSITY OF PITTSBURGH

ENGINEERING ALUMNI REGISTER

This Register contains a complete list of all graduates of the University who took a degree in engineering, except in the School of Mines.

The addresses and occupations have been corrected in accordance with information furnished up to February 1st, 1912.

The Dean has been assisted in the preparation of this Register by Emeritus Professor Carhart, Professors Frost, Stewart and Smith.

OPPORTUNITIES FOR APPOINTMENTS

The School of Engineering receives inquiries from time to time for men to fill positions in engineering work. These positions are often for graduates who have had a few years' experience, and many times we are unable to fill them owing to the fact that we do not have the addresses of all the graduates, some of whom may wish to consider such positions.

If you employ engineers, and at any time have a demand for men of experience, or for undergraduates without experience, we should be glad to have you communicate with the Dean of the School of Engineering.

ABBREVIATIONS

*Deceased.
C. E. Civil Engineer.
M. E. Mechanical Engineer.
E. E. Electrical Engineer.
Eng. Student for a time in engineering.

1846

*Morley, Isaac, C. E.
*Stilley, Edward J., C. E.

1858

*Marshall, Thomas F., C. E.

1870

Reed, James, C. E.

1873

*Hartupee, William Dilworth, M. E.

1874

Smith, William R., Eng.
*Stewart, Charles A., Eng.

1875

Neeld, Almos D., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.
Trimble, Robert, Eng., Chief Engineer, Maintenance of Ways, Pennsylvania Co., Union Station, Pittsburgh, Pa.

1876

McCullough, Ross, C. E.

1877

*Canfield, Morris Pierpont, C. E.

1878

Jordao, Francisco Rodigues, C. E., San Paulo, Brazil.
Sickman, Albert F., C. E., Hydraulic Engineer, Holyoke Water Power Co., Holyoke, Mass.

1879

Gilfillan, Alexander, C. E.
Keller, Charles, C. E., [illegible] Biddle Ave., Wilkinsburg, Pa.
Swan, [illegible] A. Gillespie Company, Westinghouse

[illegible]

80

[illegible] nist, Carnegie Steel Co., Duquesne, Pa.

31

[illegible]

[illegible]

[illegible], C. E.
Buente, Charles F., C. E.
Carey, Joseph F., C. E., 4241 University Boulevard, Santiago, California.
Mesta, George F., C.E., President Mesta Machine Co., Pittsburgh, Pa.
Stewart, Reid T., C. E., Head of Department of Mechanical Engineering, University of Pittsburgh; Consulting Engineer, National Tube Co., Pittsburgh, Pa.

ENGINEERING ALUMNI REGISTER

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If you employ engineers, and at any time have a demand for men of experience, or for undergraduates without experience, we should be glad to have you communicate with the Dean of the School of Engineering.

ABBREVIATIONS

1883

Coffin, William C., C.E., Structural Engineer, Jones & Laughlin Co., Pittsburgh, Pa.

1884

Gray, James C., C.E.
McCabe, Junius D., C.E., 341 Fourth Ave., Pittsburgh, Pa.

1846

*Morley, Isaac, C. E.
*Stilley, Edward J., C. E.

1858

*Marshall, Thomas F., C. E.

1870

Reed, James, C. E.

1873

*Hartupee, William Dilworth, M. E.

1874

Smith, William R., Eng.
*Stewart, Charles A., Eng.

1875

Neeld, Almos D., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.
Trimble, Robert, Eng., Chief Engineer, Maintenance of Ways, Pennsylvania Co., Union Station, Pittsburgh, Pa.

1876

McCullough, Ross, C. E.

1877

*Canfield, Morris Pierpont, C. E.

1878

Jordao, Francisco Rodigues, C. E., San Paulo, Brazil.
Sickman, Albert F., C. E., Hydraulic Engineer, Holyoke Water Power Co., Holyoke, Mass.

1879

Gilfillan, Alexander, C. E.
Keller, Charles, C. E., Retired, 117 Biddle Ave., Wilkinsburg, Pa.
Swan, Robert, C. E., Contractor, T. A. Gillespie Company, Westinghouse Bldg, Pittsburgh, Pa.

1880

Camp, James McI., C. E., Chief Chemist, Carnegie Steel Co., Duquesne, Pa.

1881

Danse, Leopold O., C. E.

1885

*Bray, Harry E., C. E.
Buente, Charles F., C. E.
Carey, Joseph F., C. E., 4241 University Boulevard, Santiago, California.
Mesta, George F., C.E., President Mesta Machine Co., Pittsburgh, Pa.
Stewart, Reid T., C. E., Head of Department of Mechanical Engineering, University of Pittsburgh; Consulting Engineer, National Tube Co., Pittsburgh, Pa.

1886

McKean, Robert Andrews, C. E., Superintendent Structural Dept., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Patterson, Peter C., Eng., Chief Engineer, National Tube Co., Frick Bldg., Pittsburgh, Pa.

Rosewell, Joseph T., C. E.

1887

Barbour, George Hurlburt, C. E., Asst. Chief Mechanical Engineer, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

Lyons, James K., C. E., Civil Engineer, Gas Power Engineering Corporation, Pittsburgh, Pa.

Nicholson, John H., Eng., Manufacturer, 3rd Vice President, Shelby Steel Tube Co., Frick Bldg., Pittsburgh, Pa.

Stoner, Frank R., Eng., Attorney, 1307 Berger Bldg., Pittsburgh, Pa.

Taylor, Samuel E,. C. E., Civil and Mining Engineer, 900 Lewis Bldg., Pittsburgh, Pa.

1888

Bright, Frederick, C. E., Checking Structural Drawings, Empire Bridge Co., Elmira, N. Y.

Crider, James L., C. E., Chief Engineer, New York, Westchester and Boston Ry. Co., 65 Beaver St., New York City.

Gilfillan, George A., C. E., Consulting Engineer, 341 Fourth Ave., Pittsburgh, Pa.

Jenkins, Jenks B., C. E., Asst. Engineer, Baltimore & Ohio R. R., Mt. Royal Station, Baltimore, Md.

McCormick, Roscoe T., C. E., Manager of Sales, Petroleum Iron Works Co., Irwin, Pa.

Smith, Richard Lesnett, C. E., Consulting Engineer, Smith & Lewis, 1444-5-6 Oliver Bldg., Pittsburgh, Pa.

1889

Barrett, John Henry, C. E., Consulting Engineer, 212 Fulton Bldg., Pittsburgh, Pa.

1890

Ehlers, Charles W., C. E., Asst. Engineer, Bureau of Surveys, Pittsburgh, Pa.

*Herron, George K., C. E.

Johnston, John P., C. E., General Manager, The New York Engine Co., Watertown, New York.

Langenheim, Gustave C., C. E., 403 Times Bldg., Pittsburgh, Pa.

1891

Carhart, Charles F., C. E., Salesman, Citizens Wholesale Supply Co., Columbus, Ohio.

Hays, James W., C. E., Civil Engineer, 55 Schmidt Bldg., Pittsburgh, Pa.
Liggett, Dudley S., C. E., Real Estate & Insurance, 705 Peoples Bank Bldg., Pittsburgh, Pa.
Mollenhauer, Frederick H., C. E., Engineer, Monongahela Nat. Gas Co., Pittsburgh, Pa.
McCabe, William P., C. E., Structural Steel Engineer, W. N. Kratzer & Co., Smallman St., Pittsburgh, Pa.
McGrew, John, C. E., John & Edward McGrew, Civil Engineers, 818 Empire Bldg., Pittsburgh, Pa.

1892

Cooper, Frederick M., C. E., Coraopolis, Pa.
Davis, Charles W., M. E., Sales Manager, Standard Underground Cable Co., Pittsburgh, Pa.
Donaldson, Joseph T., C. E., Civil Engineer, Riter-Conley Mfg. Co., Water St., Pittsburgh, Pa.
Emmons, Charles DeMoss, C. E., General Manager, Ft. Wayne & Wabash Valley Traction Co., Ft. Wayne, Indiana.
Isenthal, Leo Ralph, C. E., Railway Constructor & Operator, Stern & Silverman Inc., 605 Land Title Bldg., Philadelphia, Pa.
Kunkle, Charles E., C. E., Chief Draftsman, Jones & Laughlin Steel Co., Pittsburgh, Pa.
Miles, J. Walter, C. E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
McGrew, Anson B., C. E., U. S. Asst. Engineer, United States Engineer
Nagle, James C., C. E., Office, Farmers Bank Bldg., Pittsburgh, Pa.
Purdy, William G., C. E.
Rhea, Frank C., C. E.
Rose, George R., C. E., Merchant, 539 Lincoln Ave., Bellevue, Pa.
*Smith, John F., C. E.
Wittmer, George, Jr., M. E., Asst. General Manager, American Natural Gas Co., 407 Park Bldg., Pittsburgh, Pa.

1893

Bratt, Berton, M. E.
*Bright, Paul, C. E.
Calvert, George H., C. E., Attorney, Blakeley & Calvert, Oliver Bldg., Pittsburgh, Pa.
Douthitt, Philip, C. E., Civil Engineer, 1347 Bluff St., Pittsburgh, Pa.
Elliott, James R., C. E., Consulting Engineer, Arlington Station, California.
*Flack, Charles A., C. E.
Godfrey, Edward, C. E., Engineer with R. W. Hunt Co., Monongahela Bank Bldg., Pittsburgh, Pa.
Lauman, Walter H., C. E., 1006 Carnegie Bldg., Pittsburgh, Pa.

Ridinger, Charles W., E. E., President, Iron City Engineering Co., Grant St., Pittsburgh, Pa.

Sapp, Edward H., C. E., Civil Engineer, New York Shipbuilding Co., Camden, N. J.

Shaler, Edward C., C. E., Assistant Engineer, Surface Lines, Brooklyn Rapid Transit Co., 85 Clinton St., Brooklyn, N. Y.

Scott, Walter C., Eng., Engineer with National Tube Co., 554 Frick Annex, Pittsburgh, Pa.

Swan, John, Jr., Eng., 1105 Allegheny Ave., N. S., Pittsburgh, Pa.

Wylie, Thomas B., Eng., Mechanical Engineer, Equitable Water Co., Water St., Pittsburgh, Pa.

1894

Affelder, Louis J., C. E., Asst. Division Contracting Manager, American Bridge Co. of New York, Frick Bldg., Pittsburgh, Pa.

Brown, Robert C., C. E.

Clark, Milnor P., E. E., Mechanical Engineer with National Tube Co., Frick Annex, Pittsburgh, Pa.

Dammond, William H., C. E., Civil Engineer, 86 Lee's Hill St., Sneinton, Nottingham, England.

Douglass, Robert McC., Eng., 306 Fourth Ave. Pittsburgh, Pa.

Dunlap, John H., Eng., Manufacturer, John Dunlap Co., Pittsburgh, Pa.

Gray, Guy McC., C. E., Superintendent Motive Power, Bessemer & Lake Erie R. R., Greenville, Pa.

Hamilton, Alfred R., Eng., Coal Trade Bulletin, Park Bldg., Pittsburgh,

Howat, John B., Eng., President, Sharon Hardware Mfg. Co., Sharon, Pa.

Kehew, Everett E., Eng., Paying Teller, Keystone National Bank, Pittsburgh, Pa.

McEwen, John A., M. E., Contracting Engineer, Pittsburgh Bridge & Iron Works, Rochester, Pa.

Neubert, Walter P., E. E., Asst. Engineer, Union Switch & Signal Co., Swissvale, Pa.

Parkinson, David I., E. E., 323 Fourth Ave., Pittsburgh, Pa.

*Price, Jesse B., C. E.

1895

Dickey, Alfred C., C. E., Teacher of Mathematics, Shadyside Academy, Pittsburgh, Pa.

DuBarry, Dudley D., Eng., Draftsman, Jones & Laughlin Steel Co., Pittsburgh, Pa.

DuBarry, Harry F., Eng., 5816 Baum St., Pittsburgh, Pa.

Fawcett, Lewis B., Eng., Treasurer, Cheat Haven Coal & Coke Co., Machesney Bldg., Pittsburgh, Pa.

Gerwig, Frederick H. N., M. E., Asst. Supt., Carrie Furnaces, Carnegie Steel Co., Rankin, Pa.

Harrer, Henry, E. E., Farmer, Belgrade, Montana.

Hay, Paul Liscomb, M. E., Mechanical Engineer, Samuel Hay's Sons, 1408 Keenan Bldg., Pittsburgh, Pa.

Hoerr, Alexander L., M. E., Steam & Hydraulic Engineer, National Tube Co., McKeesport, Pa.

Hunter, Percy E., M. E., Independent Bridge Co., North Side, Pittsburgh, Pa.

Kirker, Albert H., M. E., Draftsman, U. S. Radiator Corporation, West Newton, Pa.

Macfarren, Walter W., M. E., Mechanical Engineer, Stevenson Bldg. Annex, Pittsburgh, Pa.

McKee, D. Gregg, E. E., Treasurer, Pittsburgh Trust Co., Fourth Ave., Pittsburgh, Pa.

Nevin, William C., Eng., 431 Fifth Ave. Pittsburgh, Pa.

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1896

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1897

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1898

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1899

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1900

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1902

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1903

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1904

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1906

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Eades, Herbert S., M. E., Draftsman, Master Mechanic's Office, American Bridge Co., Ambridge, Pa., 167 Watsonia Blvd., N. S., Pittsburgh, Pa.

Farmer, Homer G., C. E.

Hague, Floyd T., C. E., Apprentice, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., 7532 Hamilton Ave., Pittsburgh, Pa.

Handmacher, Benjamin B., E. E., Equipment Staff, Western Union Tel. Co., Pittsburgh, Pa.

Johnston, Arthur S., M. E., Special Apprentice, Westinghouse Air Brake Co., 709 Ninth Ave., Beaver Falls, Pa.

Lowe, Harold C., C. E., Chainman, Monongahela Division P. R. R., 825 Ridge Ave., N. S., Pittsburgh, Pa.

Mesta, Lewis W., M. E., Mesta Machine Co., Box 1124, Pittsburgh, Pa.

Miller, John Hays, C. E., Engineer, John F. Casey Construction Company, 3519 Fifth Ave., Pittsburgh, Pa.

Moore, Jay R., E. E., Manager of Works' Office, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Myler, Thomas K., C. E., Chainman, P. R. R., Trafford, Pa., Address 5512 Avondale St., Pittsburgh, Pa.

McCutcheon, Kenneth D., C. E., National Fire Proofing Co., Boston, Mass., 31 Winchester St., Brookline, Mass.

Oleson, Walter A., E. E., Equipment Inspector, Western Union Telegraph Co., 644 E. Street, N. E., Washington, D. C.

Reed, Charles S., E. E., Cadet Engineer, Denver Gas & Electric Light Co., 1101 E. Colfax Ave., Denver, Colo.

Robbins, Samuel, C. E.

Robinson, Parker M., Fore River Shipbuilding Co., 16 S. Central Terrace, Wollaston, Mass.

Seanor, Francis W., M. E.

Shapiro, Harry, C. E., Draftsman, Tube Bending & Polishing Machine Co., Baltimore, Md., 4 S. Broadway, Baltimore, Md.

Simon, Richard J., E. E., Apprentice, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Address 1906 Lowry St., N. S., Pittsburgh, Pa.

Singer, Edgar H., Jones & Laughlin Steel Co., Eliza Furnace, Pittsburgh, Pa., 122 Fifth Ave., Pittsburgh, Pa.

ENGINEERING ALUMNI

UNIVERSITY OF PITTSBURGH

Name	Degree	Class
Abel, Albert E.	M.E.	1911
Adams, Frank N.	M.E.	1906
Affelder, Louis J.	C.E.	1894
Ambrose, Frederic B.	E.E.	1907
Angle, Philip E.	M.E.	1908
Barbour, George H.	C.E.	1887
Barr, J. Toner	Eng.	1901
Barrett, John H.	C.E.	1889
Bates, H. H.	C.E.	1908
Bauer, George F.	C.E.	1900
*Beckert, Jacob C.	M.E.	1896
Bender, Allan P.	E.E.	1906
Benner, Jacob W.	M.E.	1901
Bennett, Edward	E.E.	1897
Biggert, Florence C.	M.E.	1899
Biggs, George W., Jr.	C.E.	1897
Blackadore, John	C.E.	1900
Boddie, Clarence A.	E.E.	1908
Boland, Jerome A.	C.E.	1909
Bole, Thomas M.	C.E.	1907
Boothe, Willis	C.E.	1903
Boyd, Thomas W.	Eng.	1896
Bradshaw, William M.	E.E.	1897
Bratt, Berton	M.E.	1893
*Bray, Harry E.	C.E.	1885
Bright, Frederick W.	C.E.	1888
Bright, Graham	E.E.	1897
*Bright, Paul	C.E.	1893
Brinker, Wm. E.	Eng.	1902
Brown, Robert C.	C.E.	1894
Brown, Thomas H.	C.E.	1903
Brunner, Elmer H.	C.E.	1906
Buene, Charles F.	C.E.	1885
Butz, Harry A.	E.E.	1898
Byers, Orah M.	E.E.	1904
Calvert, George H.	C.E.	1893
Camp, James McIntyre	C.E.	1880
Campbell, John T.	C.E.	1910
Canfield, Maurice P.	C.E.	1876
Cannon, Edgar C.	C.E.	1909
Carey, Joseph F.	C.E.	1885
Carhart, Thomas C.	C.E.	1907
Chalfant, Frederick B.	C.E.	1902
Clark, Milnor P.	E.E.	1894
Coates, Edward S.	E.E.	1900
Cochran, Charles E.	C.E.	1898
Coffin, William C.	C.E.	1883
Collins, Frank S.	M.E.	1900

Name	Degree	Class
Collins, Palmer	M.E.	1899
Conwell, Erle McK.	E.E.	1911
Cooper, Frederick M.	C.E.	1892
Cooper, Walter S.	C.E.	1904
Cooper, William M.	M.E.	1907
Craig, Paul S.	C.E.	1904
Crampton, B. P.	E.E.	1904
Crea, Thomas C.	C.E.	1905
Creelman, Leonidas J.	C.E.	1907
Crider, James L.	C.E.	1888
Crum, Frank M.	C.E.	1910
Cullers, William H.	C.E.	1901
Curry, Grant	M.E.	1908
Dambach, Wm. N.	C.E.	1905
Dammond, Wm. Hunter	C.E.	1894
Daugherty, Rush L.	E.E.	1906
Davis, Alfred C.	E.E.	1897
Davis, Charles W.	M.E.	1892
Davis, Karl E.	C.E.	1910
Davis, Roland R.	E.E.	1905
Dawson, Wm. E.	C.E.	1904
Decker, James C.	C.E.	1909
Desch, John L.	C.E.	1908
DesIslets, John C.	Eng.	1901
DeVore, Henry C.	M.E.	1898
Dickey, Alfred C.	C.E.	1895
Dietz, Louis A.	C.E.	1896
Dinger, Layard E.	C.E.	1907
Dodds, Samuel R.	E.E.	1903
Donaldson, Joseph T.	C.E.	1892
Dornbush, Charles C.	C.E.	1897
Dornbush, George A.	C.E.	1904
Dougherty, Lemuel H.	C.E.	1902
Douglass, Robert McC.	Eng.	1894
Douglass, Thomas L.	C.E.	1907
Douthitt, Philip	C.E.	1893
Drexler, Louis A.	Eng.	1898
DuBarry, Dudley D.	Eng.	1895
DuBarry, Harry F.	Eng.	1895
Duff, John M.	M.E.	1905
Dunlap, John H.	Eng.	1894
Dunnells, Clifford G.	Eng.	1896
Dygert, Warren B.	C.E.	1910
Eades, Herbert S.	M.E.	1911
Earl, Howard A.	C.E.	1901
Edgar, William C.	C.E.	1908
Edwards, Edward T.	M.E.	1903
Ehlers, Charles W.	C.E.	1890

Name	Degree	Class
Ehrman, Sidney	C.E.	1904
Eisenbeis, Walter H.	E.E.	1902
Elliott, James R.	C.E.	1893
Elliott, Welday S.	M.E.	1907
Ellwood, Orville A.	M.E.	1904
Elverson, Howard W.	Eng.	1896
Emmons, Charles DeM.	C.E.	1892
*Eshelman, R. D.	C.E.	1908
Farmer, Homer G.	C.E.	1911
Farmer, James McD.	Eng.	1902
Farrar, Silas C.	M.E.	1896
Farris, John	C.E.	1909
Fawcett, Lewis P.	Eng.	1895
Ferree, Eugene C.	E.E.	1910
Filson, George C.	C.E.	1904
Finley, William P.	C.E.	1905
Fisher, Wm. Clifford	C.E.	1907
Fisher, Chester G.	M.E.	1900
Fitzharris, Frederick T.	C.E.	1903
*Flack, Charles A.	C.E.	1893
Francies, Edward S.	C.E.	1897
Francies, Wm. H.	C.E.	1896
Frazier, Albert	C.E.	1910
Fullerton, Hugh L.	E.E.	1902
Ganter, Carl F.	Eng.	1904
Gerber, Christian G.	C.E.	1900
Gerwig, Frederick H. N.	M.E.	1895
*Gibson, Wm. N.	C.E.	1902
Gilfillan, George A.	C.E.	1888
Glaubitz, Hugo	C.E.	1896
Glueck, Robert J.	E.E.	1907
Godfrey, Edward	C.E.	1893
Goehring, Charles P.	C.E.	1900
Goldie, William, Jr.	M.E.	1898
Gormley, Frank N.	C.E.	1904
Gray, Arthur E.	M.E.	1899
Gray, Guy McC.	C.E.	1894
Gray, James C.	C.E.	1884
Guenther, Emil B.	M.E.	1903
Hague, Floyd T.	E.E.	1911
Hamilton, Alfred R.	Eng.	1894
Hammer, Howard G.	Eng.	1900
Handleman, Morris	C.E.	1906
Handmacher, Benjamin B.	E.E.	1911
Hanna, Roscoe E.	Eng.	1899
Hansen, William K. W.	M.E.	1901
Harlan, Clarence H.	C.E.	1906
Harley, John D.	M.E.	1908
Harlow, James H., Jr.	C.E.	1896
Harrer, Henry	E.E.	1895
Hartman, Charles M.	M.E.	1907
*Hartupee, Wm. Dilworth	M.E.	1873
Hay, Paul Liscomb	M.E.	1895
Hays, James W.	C.E.	1891
Haynes, Harold A.	E.E.	1910
Henrici, Frederick Wm.	C.E.	1905
Herr, Andrew G.	Eng.	1901
*Herron, George K.	C.E.	1890
Hillman, John J., Jr.	Eng.	1901
Hindman, William S.	C.E.	1898
Hockensmith, Wilbur D.	M.E.	1901
Hoerr, Alexander L.	M.E.	1895
Hoffman, John W.	Eng.	1902
Hogg, David M.	M.E.	1903
Hoopes, Henry T.	E.E.	1897
Horne, George H.	E.E.	1907
Horner, Joseph T.	E.E.	1896
House, Edward B.	Eng.	1896
Howatt, John B.	Eng.	1893
Hunter, Harry M. L.	M.E.	1896
Hunter, Percy E.	M.E.	1895
Hunter, Samuel K.	C.E.	1900
Hurst, Olver C.	M.E.	1898
Inglefield, Charles L.	E.E.	1908
Irwin, Lee S.	Eng.	1899
Isenthal, Leo Ralph	C.E.	1892
Jack, Wilbur Lee	Eng.	1896
Jamison, Richard H.	C.E.	1908
Jenkins, Jenks B.	C.E.	1888
Johnson, Frank E.	Eng.	1901
Johnston, Arthur S.	M.E.	1911
Johnston, Edward VanD.	M.E.	1897
Johnston, John P.	C.E.	1890
Jones, Archibald R.	C.E.	1905
Jones, Lester B.	M.E.	1904
Junkin, Hays MacLean	M.E.	1904
Kanhofer, Walter G.	C.E.	1908
Kehew, Everette E.	Eng.	1894
Keller, Charles	C.E.	1879
Kelly, Henry E.	E.E.	1898
Keenan, Albert W.	C.E.	1908
Kier, Samuel M.	E.E.	1897
Kincaid, Charles W.	E.E.	1910
Kirker, Albert H.	M.E.	1895
Kiser, Alexander B.	E.E.	1897
Kissinger, George B.	C.E.	1908
Knight, Walter S.	M.E.	1905
Knopf, Julius R.	M.E.	1901
Knotts, William W.	M.E.	1910
Kramer, Frank P.	M.E.	1905
Kunkle, Charles E.	C.E.	1892
Lambie, Charles S.	C.E.	1900
Lambie, Joseph S.	C.E.	1907
Langenheim, Gustave G.	C.E.	1890
Lauman, Walter H.	C.E.	1893

Name	Degree	Class
Layng, Frank R.	Eng.	1900
Libbey, James T.	C.E.	1904
Liggett, Dudley S.	C.E.	1891
Liggett, Sidney S.	Eng.	1897
Linn, Guy F.	M.E.	1902
Long, Frederick A.	C.E.	1909
Lowe, Harold C.	C.E.	1911
Lyons, James K.	C.E.	1887
Macfarren, Walter W.	M.E.	1895
Machesney, Harold B.	Eng.	1903
Magaw, Harry D.	M.E.	1908
Marsh, Howard G.	M.E.	1906
*Marshall, Thomas F.	C.E.	1858
Martin, James R. McI.	E.E.	1909
Maxwell, Robert G.	C.E.	1905
Mesta, George	C.E.	1885
Mesta, Lewis W.	M.E.	1911
Miles, J. Walter	C.E.	1892
Millar, William E.	C.E.	1910
Miller, Frank F.	M.E.	1901
Miller, John A. W.	M.E.	1901
Miller, John Hays	C.E.	1911
*Miller, Ralph W.	C.E.	1899
Mitchell, Lindsay LaC.	E.E.	1907
Mitchell, William H.	M.E.	1901
Mitchell, Wayne S.	E.E.	1906
Mohler, Ross Chester	M.E.	1908
Mollenhauer, Frederick H.	C.E.	1891
Moody, Wm. Falley	Eng.	1901
Moon, Charles S.	Eng.	1895
Moore, Jay R.	E.E.	1911
Morganstern, Ralph M.	E.E.	1897
*Morley, Isaac	C.E.	1846
Mould, Edmund F.	Eng.	1899
Mueller, Robert G.	M.E.	1910
Mueller, William F.	M.E.	1910
Mulheim, Charles B.	M.E.	1906
Munroe, Charles L.	Eng.	1900
Murdock, William H.	Eng.	1901
Murray, William M.	C.E.	1907
Murry, John S.	C.E.	1899
Myler, Thomas K.	C.E.	1911
McCabe, Junius D.	C.E.	1884
McCabe, William P.	C.E.	1891
McCandless, William J.	C.E.	1909
McConnell, Malcom F.	M.E.	1902
McClelland, Robert T.	C.E.	1906
McCormick, Roscoe T.	C.E.	1888
McCullough, Harvey V.	C.E.	1896
McCullough, Ross	C.E.	1876
McCutcheon, Kenneth D.	C.E.	1911
McCutcheon, Norman D.	C.E.	1903
McElhinney, John H.	M.E.	1909
McEwen, John A.	M.E.	1894
McFarland, James C.	C.E.	1905
McFeeters, Guy S.	C.E.	1909
McGrew, Anson B.	C.E.	1892
McGrew, John	C.E.	1891
McGurn, Jerome S.	E.E.	1909
McHenry, Thomas	C.E.	1904
McIntyre, Elmer L.	C.E.	1909
McIntyre, John N.	C.E.	1905
McKee, Edwin B.	M.E.	1908
McKee, D. Gregg	E.E.	1895
McKean, Robert A.	C.E.	1886
McKenna, Roy C.	E.E.	1904
McKirdy, Charles W.	M.E.	1904
McMaster, Robert T.	C.E.	1896
Nagle, James C.	C.E.	1892
Neeld, Almos D.	C.E.	1875
Neeld, Almos D., Jr.	C.E.	1909
Neeld, Charles M.	C.E.	1896
Neeld, Robert E.	C.E.	1910
Neely, William R.	M.E.	1896
Neubert, Walter P.	E.E.	1894
Nevin, William C.	Eng.	1895
Nicholson, John H.	Eng.	1887
Noble, Howard A.	Eng.	1896
O'Hagan, Charles F.	C.E.	1900
Olesen, Walter E.	E.E.	1911
Orr, Almer H.	Eng.	1900
Page, Illtcd A.	M.E.	1904
Palmer, George B.	Eng.	1899
Parkinson, David I.	E.E.	1894
Parr, William P.	E.E.	1909
Partington, Joshua A.	M.E.	1905
Patterson, Peter C.	Eng.	1896
Paul, Earl W.	E.E.	1901
Fennington, Harley	M.E.	1899
Peterson, Albert A.	Eng.	1899
Plecker, May Burt	C.E.	1897
Piper, Theodore J.	C.E.	1907
Porter, James C.	Eng.	1896
Price, Edward K.	E.E.	1906
Price, David R.	E.E.	1908
*Price, Jesse B.	C.E.	1894
Price, Philip W.	C.E.	1899
*Purdy, William G.	C.E.	1892
Rall, Robert O.	M.E.	1905
Ramsey, Frank R.	C.E.	1902
Rankin, Harry H.	C.E.	1897
Ransom, George W.	E.E.	1901
Reed, Charles S.	E.E.	1911
Reed, James	C.E.	1870
Reid, Samuel	C.E.	1899
Reineman, Walter G.	C.E.	1905
Reizenstein, Harry S.	E.E.	1910
Renton, Thomas E., Jr.	M.E.	1909
Renton, Walter C.	M.E.	1909
Reuter, William C.	M.E.	1906
Rhea, Frank C.	C.E.	1892

Name	Degree	Class
Richards, Robert W.	M.E.	1910
Richey, Charles W.	C.E.	1895
Ridinger, Charles W.	E.E.	1893
Riley, Albert D.	M.E.	1898
Risacher, Joseph L.	M.E.	1909
Robbins, Samuel	C.E.	1911
Roberts, Elijah R.	E.E.	1899
Roberts, James M.	C.E.	1910
Robinson, Parker M.	M.E.	1911
Roessing, Frank M.	E.E.	1900
Roessing, Lawrence W.	C.E.	1909
*Rogaliner, Morris L.	C.E.	1899
Rogaliner, Wm. L.	M.E.	1905
Rose, Chester F.	Eng.	1907
Rose, George R.	C.E.	1892
Rosewell, Joseph T.	C.E.	1886
Rosser, Charles M.	E.E.	1904
Routh, Charles M.	M.E.	1908
Rudolph, Clyde A.	E.E.	1909
Russell, John W.	E.E.	1899
Rust, Frank, Jr.	Eng.	1896
Salkeld, Roy C.	C.E.	1908
Sapp, Edward H.	C.E.	1893
Schaeffer, James G.	M.E.	1905
Schaefer, Ralph G.	C.E.	1906
Schreiber, John W.	M.E.	1907
Schweppe, Walter	M.E.	1907
Scott, Walter C.	Eng.	1893
Seanor, Francis W.	M.E.	1911
Shaler, Edward C.	C.E.	1893
Shanor, Edgar E.	M.E.	1904
Shapiro, Harry	C.E.	1911
Sherbon, George E.	C.E.	1908
Shriver, Karl H.	C.E.	1908
Shrom, William G.	M.E.	1897
Sickman, Albert F.	C.E.	1878
Silliman, Guy F.	C.E.	1906
Simon, Richard	E.E.	1911
Singer, Edgar H.	C.E.	1911
Slaymaker, Philip K.	M.E.	1898
*Smith, John F.	C.E.	1892
Smith, J. Hammond	E.E.	1898
Smith, Kosciusko McC.	E.E.	1908
Smith, Richard L.	C.E.	1888
Smith, Wm. A.	C.E.	1900
Smith, William R.	Eng.	1874
Spencer, Stewart C.	Eng.	1896
Sperling, George E.	C.E.	1898
Stackhouse, Raymond C.	E.E.	1907
Steel, Gardner	Eng.	1895
Stein, Adam, Jr.	E.E.	1903
Stewart, Charles A.	Eng.	1874
Stewart, Reid T.	C.E.	1885
*Stilley, Edward J.	C.E.	1846
Stoner, Frank R.	Eng.	1887
Strassburger, Daniel S.	C.E.	1896

Name	Degree	Class
Stuebner, Ruben	C.E.	1905
Sulzner, George T.	Eng.	1902
Supplee, Charles W.	C.E.	1909
Swan, John, Jr.	Eng.	1893
Swan, Robert	C.E.	1879
Tanner, J. Roy	Eng.	1896
Taylor, Allen R.	C.E.	1910
Taylor, Charles E.	C.E.	1904
Taylor, Ernest S.	C.E.	1906
Taylor, John L.	C.E.	1898
Taylor, Samuel A.	C.E.	1887
Terbush, Clifford C.	C.E.	1907
Thomas, Bennett T.	C.E.	1909
Thomas, Edwin L.	Eng.	1899
Thomson, Robert W.	E.E.	1907
Todd, George C.	C.E.	1903
Trees, Joseph Clifton	C.E.	1895
Trimble, Alexander F.	C.E.	1897
Trimble, Robert	Eng.	1875
Truxall, Edward L.	M.E.	1906
Turner, Charles A.	E.E.	1908
Turner, George F.	C.E.	1903
Turner, Howard Q.	Eng.	1893
Van Blarcom, Conant	M.E.	1907
Vandivort, Samuel E.	C.E.	1908
Voelker, Aloys	C.E.	1910
Waggoner, Charles W.	C.E.	1903
Wagner, Gustave E. T.	M.E.	1904
Wahr, Harry F.	M.E.	1903
Wallace, Frederick J.	M.E.	1909
Wallace, Richard W.	E.E.	1902
Ward, Charles A.	M.E.	1900
Warne, Charles C.	M.E.	1903
Watt, Herman E.	M.E.	1901
Weber, John, Jr.	M.E.	1909
Weeks, Alfred B.	M.E.	1904
Weldin, William A.	C.E.	1902
Weldin, Walter J.	C.E.	1906
Werner, Edward H.	M.E.	1906
Wetzel, Walter C.	E.E.	1907
Whyte, Robert	M.E.	1906
Wilde, Herbert K.	C.E.	1897
Wiley, James G.	C.E.	1902
Willock, Roy Leech	M.E.	1909
Willock, Sylvester R.	M.E.	1905
Wilson, Albert John E., Jr.	C.E.	1906
Wilson, Henry M.	M.E.	1895
Wittmer, George, Jr.	M.E.	1892
Wittmer, Thomas	Eng.	1896
Woodson, Howard D.	C.E.	1899
Woolridge, Charles L.	Eng.	1897
Worcester, Winthrop S.	E.E.	1903
Wuth, Wm. B.	Eng.	1899
Wylie, Thomas B.	Eng.	1893
Wynne, Arthur V.	Eng.	1910
Wynne, Clarence B.	Eng.	1906
Young, Roy A.	Eng.	1910

VOL. 9 APRIL 1, 1913 No. 7

University of Pittsburgh

BULLETIN

ANNOUNCEMENT OF THE

SCHOOL OF ENGINEERING

FOR

1913 -:- 1914

AND

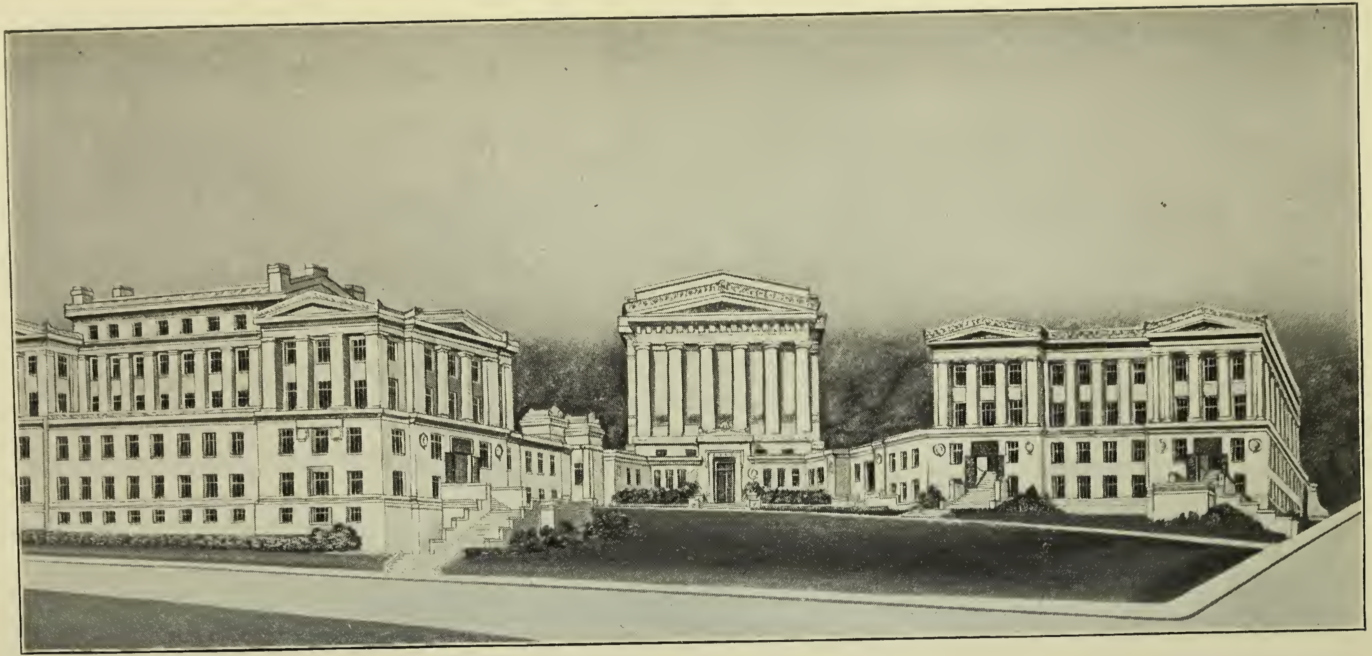
ALUMNI REGISTER

OF THE

SCHOOL OF ENGINEERING

Entered June 4, 1910 at the Post Office at Pittsburgh, Pa., as second class matter under the Act of Congress, July 16, 1894

Pittsburgh Printing Company, Pittsburgh, Pa.



Thaw Hall School of Engineering Proposed Administration Building State Hall School of Mines

VOL. 9 APRIL 1, 1913 No. 7

University of Pittsburgh

BULLETIN

ANNOUNCEMENT OF THE

SCHOOL OF ENGINEERING

FOR

1913 -:- 1914

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OF THE

SCHOOL OF ENGINEERING

1908

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CALENDAR

1913.

January 6	Monday—Winter Term, twelve weeks, begins. resumed in all schools.
February 22	Saturday—Washington's Birthday, a holiday.
February 28	Friday—Charter Day.
March 10	Monday—Spring Meeting, Board of Trustees.
March 21	Friday—Good Friday, a holiday.
March 29	Saturday—Winter Term ends.
March 31	Monday—Spring vacation of one week begins.
April 7	Monday—Spring Term of eleven weeks begins.
May 30	Friday—Memorial Day, a holiday.
June 8	Monday—Annual Meeting, Board of Trustees.
June 14	Saturday—Spring Term ends.
June 15	Sunday—Baccalaureate Sermon.
June 18	Wednesday—Commencement, all Schools.
June 23	Monday—Summer Term of ten weeks begins.
September 22-27	Monday to Saturday inclusive—Registration week.
September 26	Friday, 10:30 A. M.—Opening Assembly.
September 29	Monday—Fall Term begins.
November 27-29	Thanksgiving Recess.
December 20	Saturday—Fall Term ends.

Term vacation from Monday, December 22, to Saturday, January 3, 1914.

1914

January 5	Monday—Winter Term begins.
February 5	Thursday—Day of Prayer.
February 28	Saturday—Charter Day, a holiday.
March 28	Saturday—Winter Term ends.
March 23	Monday—Spring Vacation of one week begins.
March 30	Monday—Spring Term begins.
April 10	Good Friday—a holiday.
May 30	Saturday—Memorial Day, a holiday.
June 14	Sunday—Baccalaureate Sermon.
June 17	Wednesday—Commencement.
June 22	Monday—Summer Term begins.
August 29	Saturday—Summer Term ends.

OFFICES AND OFFICE HOURS

Office, Thaw Hall, Grant Boulevard—Consultation Hours: 8:30 A. M. to 5:30 P. M.

General Office, State Hall; Telephone Schenley 2500.

For catalogues and other information, address the Secretary of the University, Grant Boulevard.

Dean Bishop, 101 Thaw.
Professor Phillips, 303 Thaw.
Professor Stewart, 109 Thaw.
Professor Smith, 202 Thaw.
Professor Lincoln, 207 Thaw.
Professor Knowles, 406 Thaw.
Asst. Prof. Harris, 207 Thaw.
Asst. Prof. Ritter, 109 Thaw.
Mr. Dyche, 207 Thaw.
Mr. McCandliss, 202 Thaw.
Mr. Lambie, 406 Thaw.
Mr. Weber, 7 Thaw.

The Dean's Office, 101 Thaw Hall, School of Engineering is open from 8:30 A. M. to 5:30 P. M. Telephone 2500 Schenley.

FACULTY

Samuel Black McCormick, D.D., LL.D., Chancellor.

Frederic Lendall Bishop, Ph.D., Dean, Professor of Physics.

Daniel Carhart, M.C.E., Sc.D., Emeritus Professor of Civil Engineering.

Francis Clifford Phillips, Ph.D., Professor of Chemistry.

Reid Thomas Stewart, Ph.M., C.E., Professor, and Head of Department, of Mechanical Engineering.

John Hammond Smith, E.E., Professor, and Head of Department, of Civil Engineering.

————————————Professor of Industrial Chemistry and Head of Department, of Chemical Engineering.

Paul Martyn Lincoln, M.E. in E.E., Professor, and Head of Department of Electrical Engineering.

Arthur Fleming Nesbit, E.E., Professor in Electrical Engineering.

Morris Knowles, B.S., C.E., Director, Department of Sanitary Engineering.

David Francis Crawford, Director, Department of Mechanical Railway Engineering.

Leslie Huntington Harris, B.S. in E.E., Assistant Professor of Electrical Engineering.

*Iden Foster Richardson, B.S. in M.E., Assistant Professor of Mechanical Engineering.

Alexander Ritter, M.E., Assistant Professor of Mechanical Engineering.

*Ellis Edwin Bankson, B.S. in C.E., Instructor in Civil Engineering.

Joseph Sioussa Lambie, C.E., Instructor in Civil and Sanitary Engineering.

John Weber, M.E., Instructor in Mechanical Engineering.

Howard Edward Dyche, M.E. in E.E., Instructor in Electrical Engineering.

Lester Chipman McCandliss, B.S. in C.E., Instructor in Civil Engineering.

Olin Raymond McBride, B.S. in M.E., Instructor in Kinematics.

Maurice Roos Scharff, S.B., M.S., Instructor in Sanitary Engineering.

George Harry Swerger, Assistant in Elementary Mechanical Laboratory.

Charles George Kreiner, Assistant in Elementary Mechanical Laboratory.

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*On leave of absence.

Members of Faculty and Teaching Staff of Other Schools Giving Instruction in the School of Engineering

John Colvin Fettermann, Ph.B., Ph.M., Dean of the College. Professor of Biology.

Ferdinand Berger, A.M., Professor of the German Language and Literature.

Andrew Bennett Wallgren, M.D., Assistant Professor of Zoology.

Alexander Silverman, Ph.B., M.S., A.B., Professor of Analytical Chemistry.

Lincoln Robinson Gibbs, A.B., A.M., Professor of English and English Literature.

Philip Warner Harry, A.B., Ph.D., Assistant Professor of the Romance Languages.

Clarence Charles Vogt, A.B., A.M., Ph.D., Assistant Professor of Inorganic and Physical Chemistry.

John Thom Holdsworth, A.B., Ph.D., Dean of the School of Economics. Professor of Finance and Economics.

Calvin Naftzinger Wenrich, A.B., A.M., Ph.D., Assistant Professor of Physics.

Henry Leighton, A.B., Assistant Professor of Economic Geology.

Orrin Wilson Albert, A.B., A.M., Instructor in Mathematics.

Isaac Boyce, D.D., Instructor in Spanish.

Lawrence Wylie Burdick, Ph.B., A.M., Ph.D., Instructor in Latin and German.

John Kemerer Miller, A.B., Instructor in English.

Aaron Moyer Snyder, A.B., Ph.D., Instructor in Psychology.

Thomas Woodside Bentley Crafer, A.B., LL.B., A.M., A.M., PhD., Professor of Sociology.

Ira Graessle Flocken, A.B., Assistant Professor of Industry and Accounting.

Raymond Calvin Benner, B.S., A.B., A.M., Ph.D., Professor of Electrometallurgy.

Charles Shively Miller, Physical Director and Director of Athletics.

Francis Jerome Holder, B.S., A.M., Ph.D., Professor of Mathematics.

Roswell Hill Johnson, B.S., Assistant Professor in Biology and Geology.

Forest Almos Foraker, B.S., M.S., Instructor in Mathematics.

Fleming Allen Clay Perrin, A.B., Instructor in Philosophy and Psychology.

Avv Emilio Pierucci, LL.D., Instructor in Italian.

Whitford Huston Shelton, Ph.B., A.M., Instructor in Romance Languages.

Louis Franklin Snow, Ph.B., A.B., A.M., Ph.D., Instructor in English and Public Speaking.

Dayton Ulrey, A.B., A.M., Instructor in Physics.

Howard Carson Kidd, A.B., A.M., Instructor in Commerce.

CO-OPERATIVE PLAN OF ENGINEERING INSTRUCTION

The work in the School of Engineering is carried on under the co-operative plan. This means that the student, during his course, works four terms of three months each in some of the engineering industries of the Pittsburgh district, and receives the same amount of theoretical training as he would in any engineering school, in addition.

The work is conducted under actual commercial conditions. Thoroughly practical knowledge can be had only by actual work in the engineering industries and should be required as early as possible. Working side by side with other employees, students get an insight into labor conditions. Detailed observation of engineering work and the conduct of business, from the productive point of view, gained in the student's formative years, is an invaluable addition to the knowledge gained from text-books and instructors.

Although the University has made special arrangements with local industrial concerns and will co-operate with these concerns, in all possible ways, for the benefit of its engineering students, students are regarded as direct employees of the concerns. They serve for six working days each week, receive pay, are required to observe the regulations of the company, and are subject to existing labor conditions and laws, including those pertaining to liability for accident.

This industrial practice is arranged, so far as feasible, to provide every student with an opportunity of working in the branch of engineering in which he is especially interested. It is also arranged that a part of the class shall be in school and a part in practical work at the same time, interchanging in such a manner that continuous service is furnished to the manufacturer.

Each student reports to the proper instructor one evening of each alternate week, for a discussion of his practical work; at the end of the term, on presentation of a written report of his work and observations, he receives twenty credits.

FIRMS WITH WHOM THE STUDENTS DO CO-OPERATIVE WORK

City of Pittsburgh, Department of Public Health.
Duquesne Steel Foundry.
Duquesne Steel Works.
Douglass & McKnight, Civil Engineers.
John F. Casey Contracting Co.
Farris Bridge Co.
Hope Engineering and Supply Co.
Lewis Foundry Machine Co.
Mesta-Machine Co.
McClintic-Marshall Construction Co.
National Tube Company.

Pennsylvania Company.
Pittsburgh Steel Co.
Pittsburgh Transformer Co.
Pennsylvania State Department of Health.
Oliver Power Plant.
H. K. Porter Co.
Riter-Conley Mfg. Co.
Pressed Steel Car Co.
Union Switch & Signal Co.
United States Engineers Office.
Westinghouse Electric & Mfg. Co.
Westinghouse Machine Company.

VISITS OF INSPECTION

To take advantage of the opportunities offered by the Pittsburgh district, in every way possible, there has been organized a series of visits of inspection to the different manufacturing plants. These begin in the Freshman year when the visits are made in connection with Chemistry and Elementary Mechanical Laboratory, and extend throughout the entire course. During the Junior and Senior years, they are made in connection with the special work of the different departments.

Visits of inspection are preceded by a half-hour descriptive lecture by the instructor. Reports are required from each student on each visit. The following is a partial list of the plants and engineering work visited during the year 1912-1913:

American Bridge Company.
Brunot's Island Power Plant.
Beaver Bridge.
Carnegie Steel Company, Homestead Works.
Cambria Steel Company, Johnstown, Pa.
County Work House, Sewage Disposal Plant, Claremont, Pa.
Duquesne Steel Works, Duquesne, Pa.
Electrically Operated Coal Mines.
Fort Pitt Bridge Works.
H. J. Heinz Plant and Bottle Works.
Hamilton Glass Works, Pittsburgh, Pa.
Hubbard & Co., Manufacturers, Pittsburgh, Pa.
Jones & Laughlin Steel Company.
Mesta Machine Company.
McClintock-Marshall Construction Company.
National Tube Company.
Oil Well Supply Company, Pittsburgh, Pa.
Pennsylvania Railroad Test Plant, Altoona, Pa.

Pittsburgh Provision & Packing Co.
Pittsburgh Railway Company Power Plants.
Pressed Steel Car Company.
Pittsburgh and Lake Erie Repair Shop.
Pittsburgh Water Filtration Plant.
Pennsylvania Water Company, Filtration Plant.
Phipps Power Plant.
Riter-Conley Manufacturing Company.
Sewickley Bridge.
South Pittsburgh Water Filter Plant.
Shelby Steel Tube Company.
Spang Chalfant Company, Etna, Pa.
Testing Laboratory of U. S. Bureau of Standards.
United Engineering & Foundry Company.
Universal Portland Cement Company.
Union Switch & Signal Company.
Walker Soap Factory & Reduction Works.
Westinghouse Machine Company.
Westinghouse Electric & Manufacturing Company.

LIBRARIES

1. THE UNIVERSITY LIBRARY. The total number of volumes in this Library is about 9000. This includes 2,500 volumes bequeathed to the University by Robert Watson, Esq. The endowment known as the Richard Edwards, Jr., Memorial Fund, given by Mrs. George B. Edwards, provides an annual revenue for the purchase of new books. The Reading Room is at present maintained in connection with the Library and is well supplied with the leading literary and scientific periodicals.

2. DEPARTMENT LIBRARIES. The Departments of Physics, Chemistry, Psychology, and the Schools of Engineering and of Mines, and the Observatory, are supplied with libraries having special reference to the needs of the several departments. The total number of volumes in these different departments is about 6,000.

3. THE CARNEGIE LIBRARY OF PITTSBURGH, is a free reference and circulating library maintained by the city. The main building, in which the greater part of the collection is kept, is situated at the entrance to Schenley Park, within two minutes' walk of the School of Engineering. The library contains about 350,000 volumes. Of these 55,000 are on technical and scientific subjects and constitute the Department of Technology. This collection consists of the best modern works in all branches of science and technology, including sets of over three hundred journals and periodicals. About the same number of current magazines are received as soon as issued. The Department is under the charge of graduates of scientific institutions, who are always ready to give personal assistance to those seeking information along technical lines. The students of the University have the use of these books at all times, and are entitled to take out circulating volumes for home use without charge.

MUSEUMS AND LABORATORIES

1. The Smith Cabinet. This collection was formed by the two sisters whose name it bears, and is rich in beautiful mineralogical and zoölogical specimens. Especially is it noteworthy for the size and beauty of the objects from the mineral kingdom, already in place, and every year valuable additions are made, through the generosity and personal attention of the founders, of the same exceptional excellence as those with which the collection was begun, thus making it of increasing value as an exhibit as well as a basis of instruction. For the present it is stored until some of the rooms belonging to the School of Mines can be vacated by the College.

2. The Mineralogical Laboratory is equipped with thousands of specimens and the latest improved apparatus for lecture purposes, and the students' laboratory work in crystallography, mineralogy, and petrography and zoölogy. The means of instruction are quite fully given in the Bulletin of the School of Mines which will be sent to any address on application.

3. The Geological Collection. Besides the special geological collections arranged in the laboratories and lecture-rooms of the School of Mines, the arrangements made through the courtesy of the Director and Trustees of the Carnegie Museum, with part of the staff, afford abundant opportunity for paleontological study.

4. The Engineering Museum. This collection was made by Professor Stewart for the special purpose of having at hand material for illustration in the course of Mechanical Engineering. The amount of material is not extensive, but careful selection and a preparation of much of it by cross-sectioning for a better exhibit of working parts has resulted in a collection of considerable value for purposes of general instruction.

5. The Mining Laboratory is being equipped with models and with machines of unusual size employed in practical mining; and plans are partially completed for reopening and completely equipping a mine located on the University Campus, near the School of Mines Building. The needed apparatus and illustrative material for the study of general mining and practice in mining surveying is being acquired.

6. The Assaying and Metallurgical Laboratories are equipped with gas, coke and gasoline furnaces for fire assaying and metallurgical experimentation, while the laboratories are in the process of being fitted up for wet assaying and metallography.

7. The Chemical Laboratories. These, with the lecture room, occupy the entire third floor of the Engineering Building. Both lecture room and laboratories have been newly equipped throughout in the most modern manner. Separate laboratories have been installed in the follow-

ing branches: Introductory Chemistry and Qualitative Analysis; Quantitative Analysis and Food Analysis, with Balance Room in Connection; Gas and Fuel Analysis; Water Analysis; Organic Chemistry; Physical and Electro-Chemistry; Spectroscopy; Photography; Micro Chemistry and Research. On the fourth floor there is a special room for preparation and storage of distilled water, which is delivered by gravity to the various laboratories where it is on tap. A spacious store-room permits the distribution of supplies in such a manner that the requirements of students are promptly met. Machinery for suction and air pressure has been installed and a first class ventilating system provided so that the air in the laboratories may be pure at all times. The department library is well supplied with works of reference on chemistry for students' use.

8. Physical Laboratories. These are on the first and second floors of the Engineering Building. The lecture-room and large apparatus-room adjoining are on the first floor. The lecture-room has a seating capacity of 150, and is provided with all the appliances to facilitate a complete course of experimental lectures.

The general physical laboratory on the second floor is very fully equipped with new apparatus, and is complete in its appointments in every respect. Smaller laboratories are provided for photometry, advanced laboratory practice and research.

A well-equipped shop and mechanician provide excellent facilities for making and repairing apparatus.

The equipment of the department is new and includes an excellent collection of instruments for accurate measurement and investigation.

9. The Biological Laboratories are in three rooms on the second floor of State Hall. Each student working in this department is provided with a compound microscope, for which he is personally responsible. The Laboratory is provided with two incubators—one for bacteriological work, the other for vertebrate embryology. The equipment includes a Spencer rotary microtome, which is of great value in preparing serial sections of embryos, etc., also an autoclav, paraffin baths, slide microtomes, physiological apparatus, micrometer balances, bacteriological apparatus, aquaria, etc.

10. The Psychological Laboratory, in State Hall, is provided with apparatus for practical experiments and demonstrations for the courses in psychology and for use in experimental study. The laboratory has the chief pieces of apparatus required in the manuals by Sanford and Titchner, besides supplementary pieces.

There is also a good collection of models of the brain and the sense organs including Auzoux models of brain, eye and ear; Ziegler models of the embryology of the human brain; the His models; and an assortment of materials for demonstration.

11. STEAM LABORATORY. There is provided the usual equipment for measuring the pressure, temperature and flow of steam such as gauges, thermometers, calorimeters, condensers, and indicators, together with suitable apparatus for standardizing and calibrating these.

12. ENGINE AND POWER LABORATORY. The equipment for this department includes the following:

A Babcock & Wilcox 100 H. P., 200 pound pressure, boiler, with a superheating chamber, to be used in experimental and power plant work.

A complete cross-compound steam engine, 7½ inches and 18 inches by 14 inches, to be arranged to run condensing or noncondensing, high-pressure cylinder controlled by single-valve, low-pressure cylinder controlled by four valves; Corliss type. The engine is provided with a friction-brake, which serves for applying loads. Either side may be operated as a simple engine condensing or noncondensing.

A two-cylinder Westinghouse gas-engine, provided with all necessary apparatus for making gas-engine tests; to be used for experimental purposes. In addition to this there are two three-cylinder Westinghouse gas-engines for power purposes located in the laboratory.

A motor-driven air-compressor for furnishing air for laboratory needs, and arranged to be used for experimental purposes.

13. MATERIALS TESTING LABORATORY. This laboratory, when installation is complete, will be equipped with machines and instruments for the measurement of the physical properties of the materials of construction, and for tests on manufactured specimens.

Universal Testing Machines. This equipment includes three testing machines, ranging from 50,000 pounds to 200,000 pounds capacity, for tension, compression, and flexure tests. The 200,000-pounds capacity machine is capable of taking 15-foot columns, tension specimens accordingly, and flexure specimens up to 20-foot lengths.

Torsion Machine. This machine is designed for 230,000 inch-pounds, with a three-inch chucking capacity, and will care for lengths up to 15 feet.

Flexure Machine. This is a hand-power machine of 5,000 pounds capacity.

Cement-Testing Apparatus. The equipment includes two automatic briquette-testing machines, standard molds, scales, sieves, moist closet and other similar apparatus necessary for the examination of cement, cement-mortars and concrete.

Structural materials testing apparatus consists of experimental shearing and punching attachments for testing-machines, special extenso-meters for structural specimens, and a Hanna pneumatic riveter which has a capacity of 100,000 pounds die pressure.

14. HYDRAULIC LABORATORY. For hydraulic experiments there are a Worthington two-stage turbine pump, driven by a variable-speed motor a Pelton Wheel, and receiving and measuring tanks with weir discharge. There are also water-meters, orifices, nozzles, a Venturi meter, etc.

15. ELEMENTARY MECHANICAL LABORATORY. The School of Engineering will occupy sections of the new Elementary Mechanical Laboratory at the opening of the Fall Term, 1913. This Building when completed will cover an area of about 460 feet long and 40 feet wide.

The first sections to be erected will be devoted to heat treating, forging and casting of metals. To permit the study of up-to-date processes of working metals, the laboratory will contain representative types of forges and furnaces fired with coke, gas, and oil; drop forge equipment; the necessary apparatus and appliances for electric, oxy-acetylene, and thermit welding; equipment for brazing; and pneumatic riveting; and the cold pressing, punching and drawing of metals.

This laboratory will also afford facilities for bench, floor, and machine molding; core making; and the running of heats in iron, brass and aluminum. The equipment will include a standard cupola, special furnaces for iron and brass, core ovens, representative molding machines, annealing furnace, tumbling barrel, and other foundry appurtenances.

A special room will be equipped for the more scientific study of the heat treatment of metals and will include barium chloride, lead, tempering, and annealing furnaces; pyrometers; etc.

16. ELECTRICAL ENGINEERING LABORATORIES. Dynamo Room.

The Dynamo Room is equipped with representative types of the different classes of electrical machinery. This includes direct current generators, both constant and variable speed direct current motors, direct current and alternating current series motors, single phase and polyphase alternating current generators, single phase and polyphase alternating current induction motors, single phase and poly-phase alternating current synchronous motors, two phase, three phase and six phase synchronous converters, an a. c.-d. c. motor-generator set, induction regulators, various transformers, etc., to the number of about thirty pieces.

A motor driven air compressor of the type common in interurban and street car practice and a General Electric mercury arc rectifier are also included in the equipment of this room.

The laboratory is well equipped with accessory apparatus. This includes load, starting and field rheostats, dynamometers, brakes, switches, circuit breakers, the necessary portable and switchboard type measuring instruments, and a large floor crane to facilitate rapid arrangement of apparatus for special tests.

A well appointed three-panel switchboard located in the laboratory receives direct current power at 110 volts and 220 volts from the University power plant and single phase and poly-phase alternating current power from the Public Service Corporation mains and distributes it to any part of the laboratory.

In addition to the foregoing, a 60,000 volt transformer is installed in a small building permitting valuable tests. A large storage battery supplies direct current at constant voltage for special tests and furnishes at the same time suitable material for storage battery work. The University power plant is available for special work when desirable.

17. Electrical Engineering Laboratories. Standards Room.

One room is set apart for accurate work in standardizing the apparatus used in the electrical tests. This room is supplied with power by means of special circuits and a special distributing panel, and is equipped with standards of resistance, inductance and capacity. A Weston laboratory standard voltmeter and a certified Wolff potentiometer provides for accurate and rapid calibration of the measuring instruments. The usual complement of keys, switches, galvanometers, etc., is at hand.

18. Electrical Engineering Laboratories. Photometer Room.

A dark room is equipped with a ten-foot photometer bench, a universal rotator of the National Bureau of Standards type, a Hefner primary standard, secondary standards, Bunsen screens, etc., for making all kinds of tests of incandescent lamps, with and without shades.

METHODS OF ADMISSION

1. Certificates from Accredited Schools. Certificates from high schools and academies whose work has been approved by the University, and whose courses prepare for the Freshman class will be accepted. The official blank of certificate provided by the University must be used. It may be obtained, by application, from the Registrar. When filled, it must be transmitted directly to the Committee on Admission, through the Registrar, together with a letter from the Principal furnishing the certificate or certificates. There must be a precise designation, as provided for on the blank, of the school which the applicant desires to enter.

2. Certificates of the College Entrance Examination Board. Beginning with June 16, 1913, examinations conducted by the University for admission to the Freshman class, for which a definite time and schedule are provided in its own calendar will be discontinued. All who desire such examination, wholly or in part, are expected to apply and register directly for the same with the College Entrance Examination Board, Dr. Thomas S. Fiske, Secretary, Sub-station 84, New York City. These examinations are held in June annually and for the year 1913-14 begin on the date given above. They may be taken at any place most convenient including the University. Definite dates for succeeding years will

appear later. Information regarding times and places may be obtained either from the Secretary of the Board or from the Registrar of the University.

3. From Other Colleges. Students from other colleges, whose entrance requirements are equivalent to those of the University of Pittsburgh, and which offer equivalent courses of study, will be credited with the work they have done in such colleges, and admitted to advanced standing without examination.

REQUIREMENTS FOR ADMISSION

All candidates for admission to the School of Engineering must be at least sixteen years of age and furnish testimonials of good moral character. Those who come from other colleges must present certificates of regular dismissal.

The student applying for admission must offer fifteen units, a unit being a subject in which the work done is the equivalent of four recitations per week of one hour each for one year, or five of three-quarters of an hour each.

For admission to the School of Engineering the student must offer ten units, in following subjects:

English, *a,* 3 units.
Mathematics, *a, c,* Algebra, 1½ units.
Mathematics, *b, d,* Plane and Solid Geometry, 1½ units.
History, *a, b, c,* or *d,* 1 unit.
German or French, *a, b,* 2 units.
Physics, 1 unit.

Five additional units must be offered from following subjects:

Chemistry, 1 unit.
Biology, 1 unit.
Drawing, 1 unit.
Physiography, ½ unit.
Shop Work, 1 unit.
Advanced History, 1 unit.
Advanced English, 1 unit.
Latin, *a, b,* 1 to 2 units.
German, 2 units.
French, 2 units.
Trigonometry, ½ unit.

EXPLANATION OF REQUIREMENTS FOR ADMISSION

The following subjects are accepted for admission:

English Composition and Literature

a. Three units. The preparation should include the following subjects:

(1) GRAMMAR—It is expected that the applicant will be familiar with the essentials of English grammar, and will be able to explain the construction of sentences that occur in the literature he has read.

(2) COMPOSITION AND RHETORIC—The student should know the elementary principles of rhetoric, and should be able to apply them in the construction of sentences and paragraphs, and in the planning of essays. The examination is chiefly practical, and involves the ability to write good English.

No student will be accepted whose paper is notably deficient in logical development of the subject, or in such details of form as spelling, punctuation, grammar, and division into paragraphs.

(3) LITERATURE—The books recommended are the Uniform College Entrance requirements in English. Other similar works will be accepted as equivalents.

The candidate is required to write one or more paragraphs on each of several subjects chosen from a considerably large number given in the examination paper. The questions on all of the books assume a knowledge of subject-matter and structure, but those on the books prescribed for study and practice call for more detailed treatment than those on books prescribed for reading.

A—The books prescribed for reading and practice are indicated in the following groups:

Select two sub-divisions from each of the following groups, except when substitution is made from group 2-5, as provided below. Each subdivision is set off by semicolons.

Group 1. The Old Testament, including the most important narrative parts of Genesis, Exodus, Joshua, Judges, Samuel, Kings and Daniel, together with the books of Ruth and Esther; the Odyssey, with the omission of Books I-V, XV-XVII; the Iliad with the omission of Books XI, XIII-XV, XXI; Virgil's Æneid. English translations of the Odyssey, the Iliad, and the Æneid, of acknowledged literary merit, must be used.

An equivalent amount from Groups 2-5 may be submitted for the two sub-divisions of this group.

Group 2. Shakespeare's *Julius Caesar; The Merchant of Venice; As You Like It; A Midsummer-Night's Dream; Twelfth Night; Henry V.*

Group 3. Goldsmith's *The Vicar of Wakefield;* either Scott's *Ivanhoe* or Scott's *Quentin Durward;* Hawthorne's *The House of the Seven Gables;* Thackeray's *Henry Esmond;* either Dickens's *David Copperfield,* or Dickens's *A Tale of Two Cities;* Mrs. Gaskell's *Cranford;* George Eliot's *Silas Marner;* Stevenson's *Treasure Island;* Defoe's *Robinson Crusoe,* Part I.

Group 4. The de Coverley Papers in *The Spectator;* Franklin's *Autobiography;* Bunyan's *Pilgrim's Progress,* Part I; Irving's *Sketch-Book;* Macaulay's Essays on Clive and Hastings; Thackeray's *English Humorists;* selections from Lincoln, including at least two Inaugurals, the speeches in Independence Hall and at Gettysburg, the *Last Public Address,* and the *Letter to Horace Greeley,* together with a short memoir or estimate; Parkman's *Oregon Trail;* Thoreau's *Walden;* Huxley's *Autobiography* and selections from *Lay Sermons,* including addresses or *Improving Natural Knowledge, A Liberal Education,* and *A Piece of Chalk;* Stevenson's *Inland Voyage* and *Travels with a Donkey.*

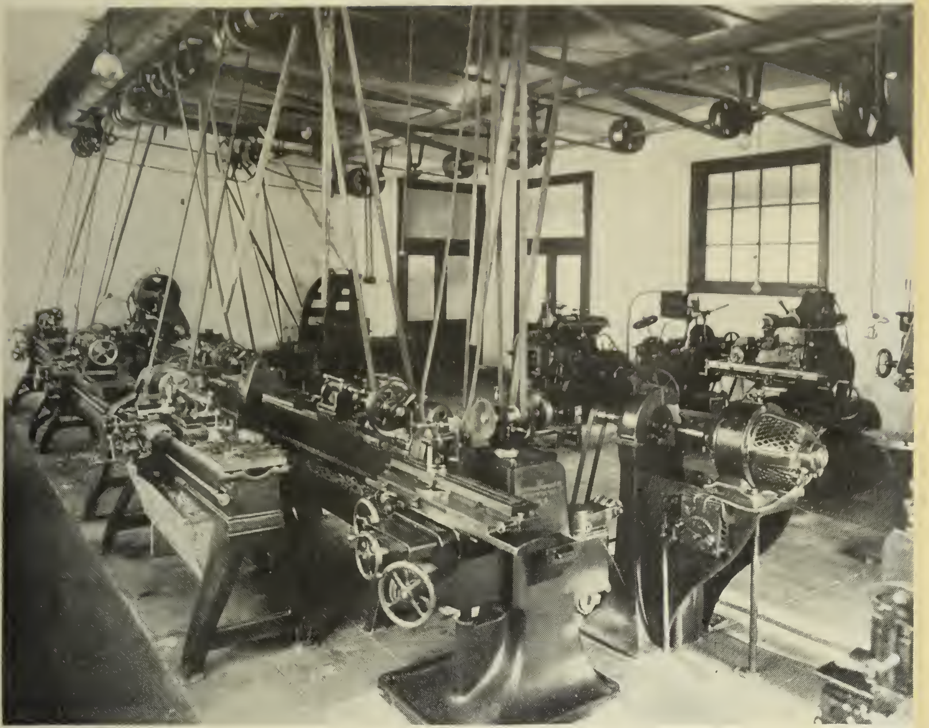
Group 5. Palgrave's *Golden Treasury* (First Series), Books II and III, with special attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's *Elegy in a Country Churchyard* and Goldsmith's *The Deserted Village;* Coleridge's *The Ancient Mariner* and Lowell's *The Vision of Sir Launful;* Scott's *The Lady of the Lake;* Byron's *Childe Harold,* Canto IV, and *The Prisoner of Chillon;* Palgrave's *Golden Treasury,* (First Series), Book IV, with special reference to Wordsworth, Keats, and Shelley; Poe's *The Raven,* Longfellow's *The Courtship of Miles Standish,* and Whittier's *Snow-Bound;* Macaulay's *Lays of Ancient Rome,* and Arnold's *Sohrab and Rustum;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, Herve Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City.*

B—The books prescribed for study and practice are:

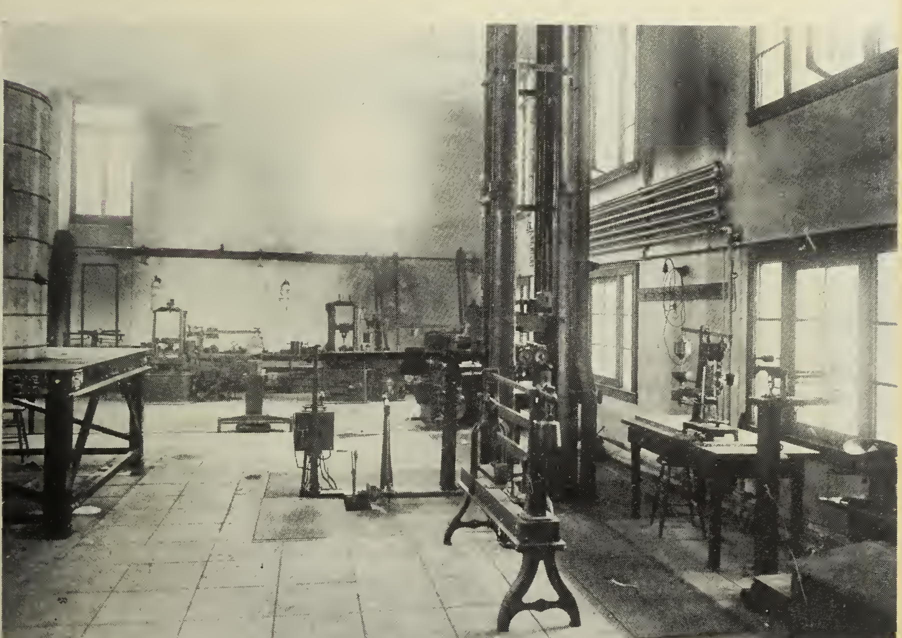
Shakespeare's *Macbeth;* Milton's *Lycidas, Comus, L'Allegro,* and *Il Penseroso;* Burke's *Speech on Conciliation with America,* or Washington's *Farewell Address and Webster's First Bunker Hill Oration;* Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns.*

b. One unit.

Advanced standing in English may be given to the graduates of high schools that have exceptionally strong and thorough courses in English throughout the entire four years. This requires additional work in literature and, especially, a thorough knowledge of the elementary principles of rhetoric, and the ability to write good English.



Machine Laboratory



200,000 Pound Universal Testing Machine

Mathematics

a. ALGEBRA THROUGH QUADRATICS.

One unit.

The four fundamental operations, factors, multiples, fractions, ratio and proportion, simple equations, methods of elimination, problems, involution, evolution, surds, exponents.

Quadratic equations, simultaneous quadratics, problems depending on quadratic equations, binominal theorem for positive integral exponents.

b. PLANE GEOMETRY.

One unit.

The usual theorems and constructions of the text-books, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons and the measurement of the circle; the solution of numerous original exercises; applications to mensuration.

c. ADVANCED ALGEBRA.

One-half unit.

Ratio, proportion, and variation; variables and limits; binominal theorem for exponents of all kinds; inequalities; series; progressions; undedermined co-efficients; partial fractions; permutations and combinations; logarithms.

d. SOLID GEOMETRY.

One-half unit.

The usual theorems and constructions of good text-books, including the relations of lines and planes in space; the properties and measurement of prisms, pyramids, cylinders, and cones; the sphere, and the spherical triangle; the solution of numerous original exercises, including loci problems; applications to the mensuration of surfaces and solids.

e. PLANE TRIGONOMETRY.

One-half unit.

A comprehensive treatment as given in ordinary texts, including trigonometric functions of angles, goniometry, trigonometric equations, solution of right and oblique triangles, and applications.

History

One unit each.

a. Ancient history, with special reference to Greek and Roman history, and including also a short introductory study of the more ancient nations and the chief events of the early Middle Ages, down to the death of Charlemagne (814).

b. Mediæval and modern European history, from the death of Charlemagne to the present time.

c. English history.

d. American history and civil government.

Each of the above topics is intended to represent one year of historical work wherein the study is given five times a week, or two years of historical work, wherein the study is given three times a week.

Latin

One unit each.

a. Grammar and elementary prose compositions. A thorough knowledge of all regular inflections, all common irregular forms, the fundamentals of syntax, and a select vocabulary.

b. Cæsar, Gallic War, books I-IV, or the equivalent from other books of the Gallic War or the Civil War, or Nepos' Lives. The examination consists of translation at sight of narrative prose similar to the above.

c. Cicero, the four orations against Catiline and the orations for Archias and for the Manilian Law, or the equivalent from other orations of Cicero or from his letters, or from Sallust's Catiline and Jugurtha, except that the orations for the Manilian Law and for Archias are required. Advanced prose composition. The examination consists of translation (together with historical, literary, and grammatical questions) partly of passages taken from the two required orations, and partly at sight of passages similar to the above in vocabulary, syntax, and range of ideas. In addition, there is an examination in prose composition.

d. Virgil, Æneid, books I-VI, or the equivalent from other books of the Æneid, or from the Bucolics or Georgics, or from Ovid Metamorphoses, Fasti, or Trista, except that Æneid I, II and either IV or VI are required. The examination consists of translation (together with questions on grammar, prosody, literary and historical allusions, and subject-matter) partly of passages taken from the required books, and partly at sight of passages similar to the above in vocabulary, syntax, and range of ideas.

German

One unit each.

a. ELEMENTARY GERMAN. During the first year the work should comprise (1) careful drill upon pronunciation; (2) the memorizing and frequent repetition of easy colloquial sentences; (2) drill upon the rudiments of grammar; (4) abundant easy exercises designed, not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression; (5) the reading from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lessons.

b. Second Year German. During the second year the work should comprise (1) the reading of from 150 to 200 pages of literature in the form of easy stories and plays; (2) practice as before, in the translation into German of easy variation upon the matter read, and also in the reproduction, orally and in writing, of the substance of short and easy selected passages; (3) continued drill upon the rudiments of the grammar.

Stories suitable for the elementary course can be selected from the following list; Grimms' *Maerchen,* Gerstack's *Germelshausen,* Heyse's *L'Arrabiata,* Storm's *Immense,* Baumbach's *Der Schwiegersohn,* Zchokke's *Der Zerbrochene Krug,* Hillern's *Hoeher als Die Kirche.*

Among shorter plays the best available are perhaps: Benedix's *Der Prozess, Der Weiberfreund;* Elz's *Er ist nicht eifersuechtig;* Wichert's *An der Majorsecke;* Wilhelm's *Einer muss heiraten.*

c. Third Year German. The work should comprise the reading of about 400 pages of moderately difficult prose and poetry with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatrical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tense and modes, and likewise upon word-order and word-formation.

Suitable reading matter for the third year can be selected from such works as the following: Freytag's *Die Journalisten* and *Bilder aus der Deutschen Vergangenheit*—for example, *Karl der Grosse, Aus den Kreuzzuegen, Doktor Luther, Aus dem Staat Friedrichs des Grossen,* Gerstæcker's *Irrfahrten,* Hoffman's *Historische Erzaehlungen,* Riedl's *Der Fluch der Schoenheit,* Schiller's *Wilhelm Tell, Der Neffe als Onkel, Das Lied von der Glocke,* Wildenbruch's *Das edle Blut.*

French

One unit each.

a. Elementary French. In the first year the work should comprise (1) careful drill in pronunciation; (2) the rudiments of grammar; (3) easy composition; (4) the reading of from 150 to 200 duodecimo pages of easy French prose; (5) the writing of French from dictation.

b. Second Year French. During the second year the student should read from 300 to 400 pages of easy modern prose. Suitable texts are: Halevy's *L' Abbè Constantin;* Bruno's *Le tour de la France;* Malot's

Sans famille; Labiche and Martin's *La poudre aux yeux* and *Le voyage de M. Perrichon;* Dumas' *L' Evasion du Duc de Beaufort.* Continued drill upon the rudiments of grammar, the mastery of the chief irregular verbs, dictation, practice in French conversation.

c. THIRD YEAR FRENCH. In the third year from 500 to 600 pages of French of ordinary difficulty should be read. The essentials of French syntax are required, with constant practice in the use of spoken French. Suitable texts are: Daudet's *Contes;* About's *Le Roi des Montagnes;* Merimèe' *Colomba;* Augier's *Le Gendre de M. Poirer;* Mollière's *Le Bourgeois Gentilhomme;* Maupassant's *Contes;* George Sand's *La Mare au Diable;* Scribe's plays.

Physics

One unit.

The candidate will be expected to be familiar with the fundamental principles of Physics. A sufficiently extended treatment of the subject will be found in any of the principal text-books now in use in secondary schools, such, for instance, as Milliken and Gale, Carhart and Chute, Hoadley, Mann, and Twiss.

It is furthermore very desirable for the student to have received training in laboratory work; but for the present no laboratory work will be required.

Chemistry

One unit. The knowledge gained, if elementary, should be comprehensive and exact, including facts and laws. Laboratory work, emphasizing descriptive chemistry is necessary and notes of this work must be presented. Much attention should be given to solution of problems.

Biology

One unit. Under this one head are grouped the subjects of botany, zoölogy, and physiology. The one unit may be composed of a single subject or of an combination of two. Laboratory exercises or field work equal in time at least to that given to text-book and lecture is essential. In offering subject for credit the names of the text-books used should be given.

Physiography

One-half unit. This subject, otherwise known as physical geography, must have been pursued as a special subject and not as a part of the earlier study of general geography, and a standard text-book, dealing with the subject solely must have been used.

Drawing

One Unit. Either free-hand or mechanical drawing, or both, may be offered. Specimens of the work done must be presented, properly certified by the instructor, with a statement of the length of time taken in the course which they represent.

Shop-Work

One unit. The work done must usually have been of the systematic kind prescribed in courses of manual training.

CONDITIONS

No student with more than three units of entrance conditions will be admitted to regular classification. Conditions must be partly removed before the second year and wholly before the third.

Advanced Standing—Students entering with more than 15 units may receive college credit for high school work in excess of the 15 only by taking special examination in this work on entering the University.

Students in the School of Engineering who fail to pass in 50 per cent of their work will not be registered in the following term except by special action of the faculty.

TUITION AND FEES

The tuition covers all fees except those specified below and must be paid upon registration, with all current fees, before name can be entered on class rolls.

Tuition

First term, every year	$ 40.00
All other terms, each	35.00
If paid in advance for three (3) terms	105.00

Fees

Matriculation, payable on admission to University	$ 5.00
Diploma	5.00
Gymnasium, each term	2.00
Chemistry, each course	5.00
Physics, each laboratory course	5.00
Biology, one course	3.50
Biology, each additional course	1.75
Engineering Laboratory, each term	5.00
Shop, each term	5.00

DEGREES IN ENGINEERING

The degrees conferred upon those who have been in residence during their last year and who shall complete satisfactorily the courses offered by the School of Engineering will be respectively:

Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, Bachelor of Science in Electrical Engineering, Bachelor of Science in Chemical Engineering, Bachelor of Science in Sanitary Engineering.

THESIS. A thesis is required of every candidate for any one of the degrees given. The thesis subject, together with an outline of the work proposed, must be approved by the head of the department in which the student is classified, not later than January 15th preceding commencement; and when so approved will be assigned him on a blank furnished for the purpose. A memorandum of this assignment must be filed in the office of the Dean.

The thesis in the proposed final form should be submitted to the Professor in charge at least two weeks prior to commencement.

The results obtained and the thesis prepared in connection with a regularly assigned thesis subject are the property of the University and no part of the thesis may be published without the consent of the Chancellor.

Upon giving evidence of having successfully practiced engineering for a period of at least three years, accompanied by a satisfactory thesis showing the application of engineering principles to some important project, the corresponding engineering degree will be conferred upon graduates of this school.

ADVANCED STANDING IN ENGINEERING COURSES

Graduates of the College of this University, or of any other college of high standing, who desire to prepare themselves for the engineering profession, will be matriculated in the School of Engineering upon presentation of their diplomas and evidence that they have pursued mathematical and scientific studies justifying their entering one of the advanced classes. By availing themselves of this provision graduates from classical or general scientific courses may obtain a professional training in engineering in two or three years after taking a first degree, and may enter upon their practical work with a broader education than can be obtained by taking a regular engineering course. Students of the University, in the College, will be advised as to the best selection of electives to make, to the end that they may enter an engineering course for an additional degree at as high a point as possible and with the fewest conditions.

COURSES IN ENGINEERING

The several courses in engineering, are planned to meet fully the requirements of prospective engineers, but are subject to some modification in the case of students who are preparing for a special branch of the engineering profession. Proposed substitutes for prescribed courses must be approved by the heads of the departments concerned, at least two weeks before the beginning of the term in which such courses are scheduled.

All regular courses are made up of eleven terms of eleven to twelve weeks each, spent in school, and four terms spent in the engineering industries of the Pittsburgh district, making a total of fifteen terms' work required for graduation.

The schedule of work in the Co-operative plan adopted is as follows: during the Freshman year, the last term of the Sophomore year, and the whole of the Senior year, all students of the same class are together in school. During the rest of the time, each class is divided into two sections which alternate quarterly between school and practical work. The first year's work is the same for all, and lays a broad foundation for any engineering course, at the same time giving the student a year in which to become so familiar with the different courses that he may decide which to pursue, with greater confidence in his choice.

COURSE IN CIVIL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 6	53	5	5	7	53	5	5	8	53	5	5
Chem	4–7	54	8	4	5–8	54	8	4	8	54	6–9	4
Graph	1	29	3	1	2	29	6	2	3	29	3	1
M. Eng	1a	36	8	4	2a	36	7	3	3a	36	7	3
C. Eng	....	....	....	....	....	....	....	....	1	31	5	3
Ger. or Rom.	1	59–60	3	3	2	59–60	3	3	3	59–60	3	3
Engl.	4	58	4	4	5	58	4	4	6	58	3	3
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	53	5	5	10	53	4	4	....	....	....	....
Phys.	11	53	7	5	12	53	7	5	13	53	7	5
Graph	4	29	6	2	5	29	4	2	5A	29	4	2
C. Eng	2	31	7	3	3	31	3	1	5	31	8	4
C. Eng	....	....	....	....	19	35	1	1	19	35	1	1
C. Eng	....	....	....	....	5A	32	2	2	....	....	....	....
Psych.	....	....	....	....	4	57	3	3	....	....	....	....
Biol.	....	....	....	....	....	....	....	....	3	56	4	2
Min.	....	....	....	....	....	....	....	....	1	57	6	2
Mech	....	....	....	....	....	....	....	....	1	30	5	5
Ger. or Rom.	7	60	3	3	8	60	3	3	....	....	....	....
Engl.	*7	59	3	3	....	....			....	....	....	....
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
*or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech.	2	30	5	5	....	....	....	....		....		
Mech.	3	30	3	1	....	....	....	....		....		
Mech.	4	30	7	3	....	....	....	....		....		
S. Eng.	....	....	....	....	1	46	4	4		....		
S. Eng.	....	....	....	....	2	46	3	1		....		
C. Eng	6	32	4	2	7	32	2	2		....		
C. Eng	19	35	1	1	19	35	1	1		....		
C. Eng	....	....	....	....	15	34	5	5		....		
E. Eng	2	42	5	3	....	....	....	....		....		
M. Eng.	....	....	....	....	4	38	5	3		....		
Geol.	1	57	3	3	2	57	3	3		....		
Econ	3E	51	3	3	....	....	....	....		....		
Astron.	....	....	....	....	1	58	3	3		....		
	FALL TERM				WINTER TERM				SPRING TERM			
C. Eng	4	31	6	4	10	33	5	2	12	33	5	3
C. Eng	8	33	3	3	11	33	7	3	14	34	4	2
C. Eng	9	33	5	2	13	34	4	2	18	35	10	4
C. Eng	16	34	10	4	17	35	10	4	....	....	....	....
C. Eng	19	35	1	1	19	35	1	1	19	35	1	1
C. Eng	20	35	3	1	20	35	3	1	20	35	3	1
C. Eng	....	....	....	....	21	36	....	2	21	36	....	4
Econ	10	51	2	2	11	51	2	2	....	....	....	....
Econ	13	51	2	2	16	51	2	2	46	52	3	3
Econ	21	52	2	2	24	52	2	2	....	....	....	....
M. Eng	....	....	....	....	....	....	....	....	15	41	5	3

COURSE IN MECHANICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 6	53	5	5	7	53	5	5	8	53	5	5
Chem	4-7	54	8	4	5-8	54	8	4	6-9	54	8	4
Graph	1	29	3	1	2	29	6	2	3	29	3	1
M. Eng	1a	36	8	4	2a	36	7	3	3a	36	7	3
C. Eng									1	31	5	3
Ger. or Rom	1	59-60	3	3	2	59-60	3	3	3	59-60	3	3
Engl	4	58	4	4	5	58	4	4	6	58	3	3
Phys. Ed			3	1			3	1			3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	53	5	5	10	53	4	4				
Phys	11	53	7	5	12	53	7	5	13	53	7	5
Graph	4	29	6	2	5	29	4	2	5a	29	4	2
Mech									1	30	5	5
M. Eng	4a	37	4	2	5a	37	4	2	6a	37	4	2
Ger. or Rom	7	60	3	3	8	60	3	3	9	60	3	3
Engl	*7	59	3	3								
Min									1	57	6	2
Psych					4	57	5	5				
Phys. Ed			3	1			3	1			3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5								
Mech	3	30	3	1								
Mech	4	30	7	3								
S. Eng					1	46	4	4				
S. Eng					2	46	3	1				
M. Eng	1	37	5	3	2	38	4	2				
M. Eng	2	39	4	2	4	38	5	3				
E. Eng	3	42	5	3	4	42	5	3				
C. Eng					7	39	2	2				
Phys					15a	54	4	2				
Econ	3E	51	3	3								
	FALL TERM				WINTER TERM				SPRING TERM			
M. Eng	3	38	7	3	6	39	2	2	10	40	3	3
M. Eng	5	38	4	4	11	40	5	3	7	39	4	2
M. Eng	16	41	3	1	8	39	4	2	12	40	5	3
M. Eng	17	41	1	1	9	39	7	3	14	41	3	1
E. Eng	5	43	5	3								
C. Eng	16	34	10	4								
C. Eng	9	33	6	2								
M. Eng					13	40	6	2	15	41	5	3
M. Eng					16	41	3	1	16	41	3	1
M. Eng					17	41	1	1	17	41	1	1
M. Eng					18	18		3	18	18		3
Econ	13	51	2	2	16	51	2	2	46	52	3	3
Econ	21	52	2	2	24	52	2	2				

COURSE IN ELECTRICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 6	53	5	5	7	53	5	5	8	53	5	5
Chem	4-7	54	8	4	5–8	54	8	4	6–9	54	8	4
Graph	1	29	3	1	2	29	6	1	3	29	3	1
M. Eng	1a	36	8	4	2a	36	7	3	3a	36	7	3
C. Eng									1	31	5	3
Ger. or Rom	1	59–60	3	3	2	59–60	3	3	3	59–60	3	3
Engl	4	58	4	4	5	58	4	4	6	58	3	3
Phys. Ed			3	1			3	1			3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	53	5	5	10	53	4	4				
Phys	11	53	7	5	12	53	7	5	13	53	7	5
Graph	4	29	6	2	5	29	4	2	5a	29	4	2
Mech									1	30	5	5
M. Eng	4a	37	4	2	5a	37	4	2	6a	37	4	2
Ger. or Rom	7	60	3	3	8	60	3	3	9	60	3	3
Engl	*7	59	3	3								
Min									1	57	6	2
Psych					4	57	5	5				
Phys. Ed			3	1			3	1			3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5								
Mech	3	30	3	1								
S. Eng					1	46	4	4				
S. Eng					2	46	3	1				
Phys.	14	54	7	3	15	54	7	3				
E. Eng	1	42	5	5	6	43	5	5				
E. Eng	15	44	4	2	16	44	4	2				
E. Eng					23	46	2	2				
M. Eng	2	38	4	2	2	38	4	2				
Econ	3E	51	3	3								
	FALL TERM				WINTER TERM				SPRING TERM			
E. Eng	7	43	3	3	8	43	3	3	9	43	3	3
E. Eng	10	43	3	3	11	44	3	3	12	44	3	3
E. Eng	13	44	6	2	14	44	6	2	14a	44	6	2
E. Eng	17	45	6	2	18	45	6	2	19	45	6	2
E. Eng	20	45	1	1	20	45	1	1	20	45	1	1
E. Eng	21	45	3	1	21	45	3	1	21	45	3	1
E. Eng					22	45	3	1	22	45	3	1
E. Eng	24	46	2	2	25	46	2	2	26	46	2	2
Phys					30	54	3	3	31	54	3	3
M. Eng	4b	38	7	5								
Econ	13	51	2	2	51	52	2	2	46	52		
Econ	21	52	2	2	24	52	2	2			3	3

COURSE IN SANITARY ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5&6	53	5	5	7	53	5	5	8	53	5	5
Chem	4–7	54	8	4	5–8	54	8	4	6–9	54	8	4
Graph.	1	29	3	1	2	29	6	2	3	29	3	1
M. Eng.	1A	36	7	3	2A	36	7	3	3A	36	7	3
C. Eng.	....	....	....	....	....	....	....	....	1	31	5	3
Ger. or Fr.	1	59–60	3	3	2	59–60	3	3	3	59–60	3	3
Engl.	4	58	4	4	5	58	4	4	6	58	3	3
Phys. Ed.	....	....	3	1	....	....	3	1	....	....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	53	5	5	10	53	4	4	....	....	....	....
Chem	20	54	7	3	21	54	7	3	22	54	7	3
Phys.	11	53	7	5	12	53	7	5	13	53	7	5
C. Eng.	2	31	7	3	3	31	3	1	....	....	....	....
Ger. or Fr.	7	60	3	3	8	60	3	3	9	60	3	3
Mech	....	....	....	....	....	....	....	....	1	30	5	5
Biol	....	....	....	....	....	....	....	....	3	56	4	2
Eng.	7 *	59	3	3	....	....	....	....	....	....	....	....
Phych.	....	....	....	....	4	57	5	5	....	....	....	....
Min.	....	....	....	....	....	....	....	....	1	57	6	2
Phys. Ed.	....	....	3	1	....	....	3	1	....	....	3	1
(* or 15)	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	30	5	5	....	....	....	....				
Mech	3	30	3	1	....	....	....	....				
Mech	4	30	7	3	....	....	....	....				
S. Eng	....	....	....	....	1	46	4	4				
S. Eng	....	....	....	....	2	46	3	1				
S. Eng	....	....	....	....	3	47	7	3				
S. Eng	12	48	1	1	12	48	1	1				
Biol.	17	56	7	4	18	56	7	4				
Geol.	1	57	3	3	2	57	3	3				
Econ	3E	51	3	3	....	....	....	....				
C. Eng.	....	....	....	....	7	39	2	2				
M. Eng.	....	....	....	....	4	38	5	3				
	FALL TERM				WINTER TERM				SPRING TERM			
S. Eng.	4	47	6	2	5	47	2	2	9	48	5	3
S. Eng.	....	....	....	....	6	47	2	2	8	47	4	2
S. Eng.	....	....	....	....	7	47	11	5	11	48	4	2
S. Eng.	12	48	1	1	12	48	1	1	12	48	1	1
S. Eng.	13	48	3	1	13	48	3	1	13	48	3	1
S. Eng	14	48	1	1	14	48	1	1	14	48	1	1
S. Eng.	....	....	....	....	15	49	....	2	15	49	....	5
Biol.	19	56	7	4	....	....	....	....	....	....	....	....
Biol.	21	....	2	2	....	....	....	....	....	....	....	....
C. Eng.	8	33	3	3	....	....	....	....	....	....	....	....
C. Eng.	9	33	6	2		....	....	....	....	....	....	....
C. Eng.	16	34	10	4	11	33	7	3	12	33	3	3
Econ.	21	52	3	3	16	51	2	2	46	52	3	3
Econ.	....	....	....	....	32	52	2	2	....	....	....	....

COURSE IN CHEMICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Mathematics	5-6	53	5	5	7	53	5	5	8	53	5	5
Chemistry	4-7	54	8	4	5-8	54	8	4	6-9	54	8	4
Graphics	1	29	3	1	2	29	6	2	3	29	3	1
Mech. Eng	1a	36	7	3	2a	36	7	3	3a	36	7	3
German	1-4	59-60	3	3	2-5	59-60	3	3	3-6	59-60	3	3
English	4	58	4	4	5	58	4	4	6	58	3	3
Civil Eng	....	....	....	....	....	....	....	....	1	31	5	3
Phys. Ed	....	....	3	1	....	....	3	1		....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Mathematics	9	53	5	5	10	53	4	4	....	....	....	....
Physics	11	53	7	5	12	53	7	5	13	53	7	5
Graphics	4	29	6	2	....	....	....	....	....	....	....	....
Chemistry	20	54	7	3	21	54	7	3	22	54		
Chemistry	50	55	2	2	51	55	2	2	52	55	2	2
Eng.	7*	59	....	....	....	....	....	......	....	....	....	....
*German	7	60	3	3	8	60	3	3	9	60	3	3
†German	7a	60	2	2	8a	60	2	2	9a	60	2	2
Mechanics	....	....	....	......	....	....	....	....	1	30	5	5
Mineralogy	....	....	....	....	....	....	....	....	1	57	6	2
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
(* or 15)	FALL OR WINTER TERM				WINTER OR SPRING TERM							
Mech	2	30	5	5		....						
Mech	3	30	3	1		....						
Chem	40	55	8	4	41	55	8	4				
Chem	53	55	2	2	54 55	55	2	2				
M. Eng	2	38	4	2	2	38	4	2				
Econ	3e	51	3	3	......	....	....	......				
Option 1												
E. Eng	2	42	5	3	......	....	......	......				
M. Eng	......	....	......	......	4	38	5	3				
Metall	1	58	5	3	......	....	....	......				
Option 2												
E. Eng	3	42	5	3	4	42	5	3				
Metall	1	58	5	3	2	58	5	3				
	FALL TERM				WINTER TERM				SPRING TERM			
Chem	100	55	2	2	101	55	2	2	102	55	2	2
Econ	13	51	2	2	16	51	2	2	46	52	3	3
Ind. Chem. Lab	....	....	....	3		....	....	3	....	....	....	3
Thesis	......	....	......	.. ..	....	....	....	....	....	....	....	......
‡ M. Eng	5	38	4	4	11	40	5	3	....	....	....	......
‡ Metall	......	58	......	......	....	....	....	....	3	58	5	3
‖ Elec. Eng	5	43	5	3	....	....	....	....	....	....	....	......
‖ Electro Metall	19	58	5	5	20	... ...	5	5	21	....	5	5
§ Chem	46	55	......	3	47	55	....	3	48	55	...	3
§ Biol	17	56	7	2	18	56	7	4	....	....	....	......

* For those taking Ger. 1, 2 and 3 in 1st year.
† For those taking Ger. 4, 5 and 6 in 1st year.

‡ Option 1.—To follow Optional Group 1. 3rd year.
‖ Option 2.—To follow Optional Group 2, of 3rd year.
§ Option 3.—To follow Optional Group 1, of 3rd year.

Graphics

1. Mechanical Drawing

Mr. Lambie and Mr. McCandliss — Fall Term, 1 credit

The care and use of drafting instruments, instrument exercises, geometrical constructions, lettering, shading, exercises in drawing to scale, and dimensioning.

Three hours per week in drafting room. Freshman year.

2. Mechanical Drawing

Mr. Lambie and Mr. McCandliss — Winter Term, 2 credits

Orthographic projections, rotation of objects, oblique projections, intersections, and development of surfaces.

Six hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 1.

3. Mechanical Drawing

Mr. Lambie and Mr. McCandliss — Spring Term, 1 credit

Isometric drawing and dimensioning, sectioning, and machine drawing.

Three hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 2.

4. Mechanical Sketching and Drafting

Mr. Lambie and Mr. McCandliss — Summer or Fall Term, 2 credits

Graded exercises in the measuring and sketching of mechanical constructions, and the subsequent detail drafting of the same.

Six hours per week in drafting room. Sophomore year.

Pre-requisite: Graphics 3.

5 and 5a. Descriptive Geometry

Mr. Lambie — Winter or Spring and Summer Term, 2 credits each term

A critical study of the science of representing by drawing. The location of points, lines, planes, single-curved surfaces, surfaces of revolution, and warped surfaces, with their relations to each other; tangent lines and planes; intersection of surfaces; shades, shadows, and perspective.

One lecture and three hours in drafting room per week. Sophomore year.

Pre-requisites: Graphics 4; Mathematics 7.

6. APPLIED DESCRIPTIVE GEOMETRY

PROFESSOR SMITH 2 credits

The application of descriptive geometry and advanced drawing to engineering problems, including patterns of the developable surfaces, templets in true proportions, and detailed isometric drawings of various parts of the structures. Also, practice in the construction of templets, patterns, etc., with their use.

Six hours drawing per week.

Elective in all engineering courses.

Pre-requisite: Graphics 5.

Mechanics

1. ANALYTIC MECHANICS

PROFESSOR WENRICH Summer Term, 5 credits

This subject comprises among its topics the composition and resolution of forces, the center of gravity, the moment of inertia, radius of gyration, laws of friction and of motion, projectiles, impact, machines, work, and energy. The solution of numerous problems in application of formulas is constantly required.

Five recitations and lectures per week. Sophomore year.

Pre-requisite: Mathematics 10.

2. MECHANICS OF MATERIALS

MR. LAMBIE Fall or Winter Term, 5 credits

The resistance and elasticity of materials. The action of beams under various conditions of fixity and loading; strength of columns and shafts; combined stresses; resilience of materials; etc.

Five recitations and lectures per week. Junior year.

Pre-requisite: Mechanics 1.

3. MECHANICAL LABORATORY

MR. WEBER Fall or Winter Term, 1 credit

The experimental study of the physical properties of the materials of construction, such as iron and steel, wood, brick, stone, cement, and concrete.

Three laboratory-hours per week. Junior year.

To be taken concurrently with Mechanics 2.

4. GRAPHIC STATICS

MR. LAMBIE Fall or Winter Term, 3 credits

The solution of problems in which the stresses in frame work, beams, roof and bridge trusses are ascertained by graphical methods. Methods for dead, snow, wind, and live loads.

One lecture and six hours drawing per week. Junior year.

Pre-requisites: Graphics 4; Mechanics 1.

Civil Engineering

1. SURVEYING

MR. MCCANDLISS Spring Term, 3 credits

Lectures, recitations, and field work in the theory, use, and care of surveying instruments. The field work consists of measuring lines and angles; determining areas, running levels, dividing of land, re-locating boundaries, staking out of buildings, etc. Methods of keeping notes are explained, and notes and plots are required of every student.

Two recitations and three hours' field work per week. Freshman year.

Pre-requisite: Mathematics 5.

2. TOPOGRAPHY

MR. MCCANDLISS Summer or Fall Term, 3 credits

A course in topographical surveying, including the theory and practice of transit, plane table and stadia methods. Also the applications of railroad, highway, municipal and hydrographical surveying.

A complete topographic survey is executed. Complete notes and a topographical map are required of every student.

One recitation and six hours field work per week. Sophomore year.

Pre-requisite: C. E. 1.

3. TOPOGRAPHY

MR. MCCANDLISS Winter or Spring Term, 1 credit

A continuation of Course C. E. 2.

Three hours' drawing per week. Sophomore year.

4. GEODESY

PROFESSOR SMITH Fall Term, 4 credits

A study of the precise methods used in geodetic and topographical surveying. The mathematical development of the principles, and the application of the method of least squares, in finding the most probable values, and probable errors, of magnitudes observed in plane and geodetic surveys. Field work, including the measurement of base lines, triangulation and topography.

Three recitations and three hours' field work per week. Senior year.

Pre-requisites: C. E. 3; Mathematics 10; Astronomy 1.

5a. RAILWAY CURVES

MR. MCCANDLISS Winter or Spring Term, 2 credits

An elementary course in the theory of railway curves with sufficient practice to give familiarity with the field methods, so that the student may be prepared to undertake the more advanced Railway location.

Two recitation hours per week.

Pre-requisite: C. E. 1.

5. RAILROAD ENGINEERING, LOCATION

MR. MCCANDLISS — Summer Term, 4 credits

The reconnoissance, the preliminary survey, and the staking out of the center line. The student is required to perform the necessary mathematical calculations incident to the running of simple, compound, and transition curves, overcoming of obstacles, change of location, etc. The line is subsequently leveled, benches and reference points established, topography taken, and the profile made. The student is taught the best method of keeping the field notes and of checking them and is given exercises in the solution of problems pertaining to frogs and switches, turnouts and crossings, and the practical application of the same in the field.

Two recitations and six hours of field work per week. Sophomore year.

Pre-requisite: C. E. 3.

6. RAILROAD ENGINEERING, CONSTRUCTION

MR. MCCANDLISS. — Fall or Winter Terms, 2 credits

The student is given exercises in the means and methods of cross-sectioning, determination of grades, staking out excavations and embankments, calculating earth work, making estimates on haulage; the classification of earth work, staking out culverts, bridge-piers, abutments, and tunnels. Forms and dimensions of tunnels are considered, together with the means and methods of excavation and cost of the work.

One recitation and three hours of calculations and estimates per week. Junior year.

Pre-requisite: C. E. 5.

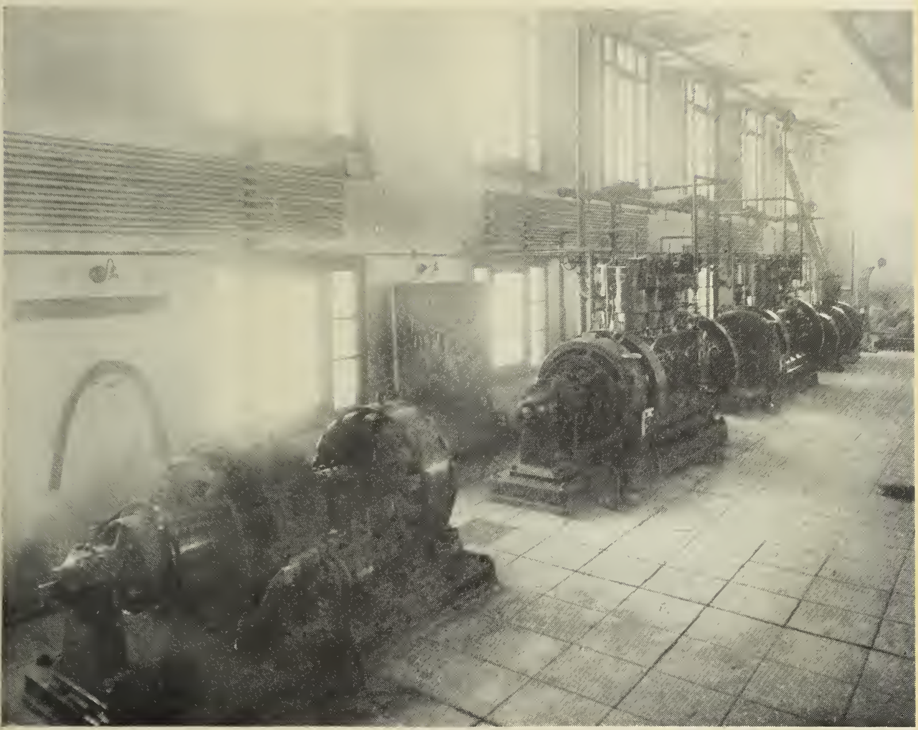
7. MASONRY CONSTRUCTION AND FOUNDATIONS

MR. LAMBIE — Spring or Summer Term, 2 credits

A study of the preparation, strength, and durability of building stones, bricks, common lime mortar, hydraulic cement mortar, and concrete; and the different kinds of masonry construction, such as dams, retaining walls, bridge piers and abutments; also the preparation of ordinary foundations, pile foundations, and foundations under water. Visits of inspection are made, when the opportunity offers, to see work in the process of construction.

Two recitations and lectures per week.

Pre-requisite: Mechanics 4.



Power Laboratory

8. CONCRETE ENGINEERING

MR. LAMBIE — Fall Term, 3 credits

A study of the mechanics of reinforced concrete, together with applications to the design of typical structures in buildings, bridges, etc. This course should be taken with C. E., 9.

Three lecture hours per week. Senior year.

Pre-requisites: Mechanics 2 and 4.

9. ENGINEERING LABORATORY

PROFESSOR SMITH, MR. LAMBIE — Fall Term, 2 credits

This course comprises laboratory work generally related to structural engineering in steel and concrete.

Four laboratory hours and one recitation per week. Senior year.
Pre-requisites: Mechanics 2, 3, and 4.

10. ENGINEERING LABORATORY

PROFESSOR SMITH — Winter Term, 2 credits

A continuation of Course C. E. 9.

Four laboratory hours and one recitation per week. Senior year.

11. ARCHES AND RETAINING WALLS

MR. MCCANDLISS — Winter Term, 3 credits

Theory of arches; external forces; character of failure by sliding, rotation, crushing. Methods of testing, stability, criteria of safety. Location of the line of resistance. Symmetrical and unsymmetrical loading. Curvature of linear arches. Rules and formulas derived from practice.

Design of retaining walls, including dams and character of failure. Theoretical and empirical formulas.

One recitation and six hours design per week. Senior year.

Pre-requisite: C. E. 8.

12. ROADS AND PAVEMENTS

MR. LAMBIE — Spring Term, 3 credits

A study of the location, width and transverse section of roads and streets, together with a study of the materials used and methods of constructing or improving the surfaces of roads and pavements.

Two recitations and three hours laboratory per week. Senior year.

Pre-requisites: Geology 1; and Mechanics 3.

13. MUNICIPAL ENGINEERING

MR. LAMBIE Winter Term, 2 credits

The subject of water supply is taken up, dealing with the quantity required, the gauging of streams by means of floats, current meters, etc., computations to determine the necessary storage to insure a given supply, the design of standpipes, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of water.

Also the drainage of buildings and lands, the sewerage of cities and towns, the design of a sewerage system for a given district, and the study of the different methods of treatment and disposal of sewage.

One lecture and recitation, with three hours field work and designing per week. Senior year.

Pre-requisites: Mechanics 2 and 5.

14. MUNICIPAL ENGINEERING

MR. LAMBIE Spring Term, 2 credits

A continuation of Course C. E. 13.

One lecture and recitation and three hours design work per week. Senior year.

15. STRESSES IN TRUSSES, AND BRIDGE DESIGN

PROFESSOR SMITH, MR. MCCANDLISS Spring or Summer Terms, 5 credits

Methods of computing stresses in roof and bridge trusses. An account of the development of bridge building and the principles of economic design, followed by a complete analysis for the stresses of a roof truss, a plate girder bridge, a pin-connected bridge, and a critical study of other standard types.

Five recitations and lectures per week. Junior year.

Pre-requisites: Mechanics 2 and 4.

16. STRUCTURAL ENGINEERING

PROFESSOR SMITH Fall Term, 4 credits

An elementary course in structural designing; including properties of rolled shapes of structural steel; structural shop methods; design and detailing of riveted joints, simple truss members, and minor trusses.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: Mechanics 4.

17. STRUCTURAL ENGINEERING

PROFESSOR SMITH — Winter Term, 4 credits

Structural engineering as applied in general; and detail designs of various steel-framed structures, including mill buildings, highway bridges, and plate-girder railroad bridges. The work consists of the complete analysis and design of the structures under a given set of specifications, followed by the practice of making complete general and detail drawings, with stress sheets, weight and cost data, and bills of material.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisites: C. E. 15 and 16.

18. STRUCTURAL ENGINEERING

PROFESSOR SMITH. — Spring Term, 4 credits

A study of pin-connected bridge trusses of the various types. The work includes the general design and determination of stresses; the detail design and detail drawings of the structure, with stress sheets, weight and cost data.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: C. E. 17.

19. CURRENT ENGINEERING TOPICS

1 credit per term

The object of this course is to increase the student's knowledge of engineering practice as well as to train him in the presentation and discussion of themes in general. Instructors and students of all classes meet on equal terms.

The work consists of original papers, reviews, and general discussions on subjects pertaining to science and engineering.

One session hour per week. Sophomore, Junior, and Senior year. Open to all students.

20. INSPECTION VISITS AND REPORTS

PROFESSOR SMITH AND MR. LAMBIE — 1 credit per term

One afternoon in each alternate week is spent in the large industrial plants or at the site of one of the notable engineering structures of the Pittsburgh district. A separate report dealing with the technical details of the inspection is required for each visit. Senior year.

Pre-requisites: C. E. 15.

21. THESIS

PROFESSOR SMITH Winter and Spring Terms, 3 credits each term

For the degree of B. S., in Civil Engineering, a thesis involving a large amount of original work in engineering must be presented in acceptable form and approved by the head of the department several days in advance of the date of graduation. The subject must be decided upon at a time not later than the ninth term of the student's course.

23. ELEMENTS OF MASONRY AND CONCRETE CONSTRUCTION

MR. LAMBIE Fall Term, 5 credits

This is an elementary course, designated to meet the needs of mining students. It comprises a brief outline of the theory, and a study of practical construction of reinforced concrete beams and slabs, masonry and concrete foundations, retaining walls and arches. The laboratory exercises include the testing of cements, sand, gravel, mortar, and concrete specimens.

Three lectures or recitations, and six laboratory hours per week. Required in Group I. School of Mines.

Mechanical Engineering

(1a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Fall Term, 4 credits

The elementary study of casting design from the standpoint of moulding and founding. The student is required to mould a graded set of patterns, run off heats, and cast a number of representative test specimens from various metals. The lecture and recitation work covers the study of the properties of castings and the production of same on a commercial scale. Inspection trips are made to local foundries.

One lecture or recitation and six hours laboratory work per week. Freshman year.

(2a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Winter Term, 3 credits

The elementary study of the treatment and properties of wrought iron, soft steel, and carbon tool steel. The student is required to forge and machine a number of representative test specimens which will bring out the characteristics and strength of materials. The lecture and recitation work covers the study of the properties of wrought metals, and the working and forging of same on a commercial scale. Inspection trips are taken to local industrial plants.

One lecture or recitation and six hours laboratory work per week. Freshman year.

(3a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Spring Term, 3 credits

Machine elements and structural details are prepared and tested, and the results reported. The lecture and recitation work includes the discussion of the results of laboratory tests and the study of the elementary features of machine and structural design.

One lecture or recitation and six hours laboratory work per week. Freshman year.

(4a) ELEMENTARY MECHANICAL LABORATORY

MR. WEBER AND ASSISTANTS Summer or Fall Term, 2 credits

A continuation of 3a together with the heat treatment of various carbon and high speed tool steels, case-hardening, etc.

One lecture or recitation and three hours laboratory work per week. Sophomore year.

(5a) PROCESSES OF MANUFACTURE

MR. WEBER Winter or Spring Terms, 3 credits

The study of up-to-date processes of manufacture, by means of visits of inspection each alternate week accompanied with lectures and reference and text book study.

Two lectures or recitations and three hours visiting or reporting per week. Sophomore year.

(6a) COSTS

MR. WEBER Summer Term, 3 credits

The study of costs with a view to familiarize the student with current prices of materials, cost of production, and the working up of a representative system of cost keeping for a manufacturing plant.

One lecture or recitation and six hours for estimating and cost keeping per week. Sophomore year.

1. KINEMATICS

PROFESSOR RITTER Fall or Winter Term, 3 credits

A study of the principles underlying the action of machine elements; the communication of motion by trains of gearing, pulleys, and belts; cams and link work; the different forms of gear teeth; automatic feed motions; quick return motions, etc.

Two recitations and three hours drawing per week. Junior year.

Pre-requisites: Graphics 5; Mechanics 1.

2. MACHINE DESIGN AND DRAWING

MR. WEBER Fall and Spring or Winter and Summer Terms, 2 credits

The proportioning of machine elements, such as shafting, pulleys, cranks, gears, cylinders, and frames. The knowledge thus gained is applied in the complete design of machines to fulfil certain requirements.

One recitation and lecture and three drawing hours per week. Junior year.

Pre-requisites: Graphics 5; Mechanics 2; M. E. 1.

3. MACHINE DESIGN AND DRAWING

MR. WEBER Fall Term, 3 credits

Continuation of Course M. E. 2.

One recitation or lecture and six drawing hours per week. Senior year.

4. PRIME MOVERS

PROFESSOR RITTER Winter Term, 2 credits

A brief study of the construction and operation of steam boilers, engines and turbines; and of gas engines and producers.

Two lectures and three laboratory hours per week. Junior year.

Pre-requisites: Mechanics 1; Physics 13.

4b. PRIME MOVERS

PROFESSOR RITTER Fall Term, 5 credits

Similar to M.E. 4, with the addition of the Thermodynamics of Heat Engines. Designed with special reference to the needs of Electrical Engineering students.

Four lectures and three laboratory hours per week. Senior year.

Pre-requisites, Mechanics 1, Physics 15.

5. THERMODYNAMICS

PROFESSOR STEWART Fall Term, 4 credits

A study of the general principles of energetics, the cycle, the thermal properties of matter, the steam engine cycle, the laws of gases, gas-engine cycles, refrigerating-machine cycles, and the thermal modifications of the theoretical cycle in actual steam and gas engines. The object of this course is to prepare the student for courses in steam-engine design, gas engines, compressed-air, refrigerating machinery, and motor cars.

Four lectures and recitations per week. Senior year.

Pre-requisites: Mathematics 10; Physics 15.

6. COMPRESSED-AIR MACHINERY

PROFESSOR RITTER Winter Term, 2 credits

A study of the physical properties of air, its isothermal and adiabatic compression and expansion, single and multiple-stage compression, and the principal types of air compressors. Visits are made for the purpose of enabling the student to see the practical working of compressed air machinery.

Two lectures per week. Senior year.

Pre-requisites: M. E. 3 and 5.

7. MOTOR CARS

PROFESSOR STEWART. Spring Term, 2 credits

This course covers a study of the construction, operation and design of modern motor cars as follows: (1) The power-plant, including gasoline motors, carburetor, ignition system, motor cooling and lubrication. (2) The transmission, including cone and multiple-disc clutches, speed-change and reverse gears, chain, bevel-gear and worm drives, differential, semi and full-floating axles, and brakes. (3) Front axles, steering mechanism, and control. (4) Frame, springs, and body. (5) Road wheels, quick detachable and demountable wheel-rims, and tires. (6) Care of car, road-rules, and how to drive. (7) Motor-trucks.

Frequent visits are made to garages and motor-car repair shops for the purpose of studying construction details and operation.

One lecture, and either three hours of drawing or laboratory per week. Senior year.

Pre-requisite: M. E. 3.

8. STEAM BOILERS

PROFESSOR STEWART Winter Term, 2 credits

A study of the principal types of steam boilers, the design of the different structural details, the proportioning of a boiler of given type and horse-power, and the design of boiler accessories. Lectures on shop practice in boiler construction and visits of inspection to boiler and other plate metal shops. A study of fuels and furnaces used in the generation of steam, and of machinery for handling coal and ash.

One lecture and three drawing hours per week. Senior year.

Pre-requisite: M. E. 3.

9. STEAM ENGINES

PROFESSOR RITTER Winter Term, 3 credits

A study of indicator cards, entropy-temperature and crank-effort diagrams for the best known types of simple and compound engines; also the design of engine details, such as crank shafts, crank pins, connecting rods, pistons, valve gears, governors, and fly-wheels. Lectures are given on shop practice in engine construction, and visits of inspection are made to study engines in process of construction and to steam power plants to study them while in operation.

One lecture and six drawing hours per week. Senior year.

Pre-requisites: M. E. 3 and 5.

10. STEAM TURBINES

PROFESSOR RITTER — Spring Term, 3 credits

A study of the theory of steam turbines and of the constructive details of the types most commonly in use for the generation of power. Visits of inspection are made to local plants to study turbines in the process of construction and in operation.

Three lectures and recitations per week. Senior year.

Pre-requisites: M. E. 3 and 5.

11. GAS ENGINES AND PRODUCERS

PROFESSOR STEWART — Winter Term, 3 credits

A study of modern gas engines and of the production of gas for motive power. A study is made of typical gas-engine details, after which the principal computations and drawings are made for a gas engine of given type and horse-power. Visits are made to see gas engines under process of construction and to see them operating.

Two recitations and lectures and three drawing hours per week. Senior year.

Pre-requisite: M. E. 3.

12. POWER-PLANT ENGINEERING

PROFESSOR RITTER — Spring Term, 3 credits

A study of the selection and proportioning of the essential details of a power-plant. Lectures are given on location of plant, type of power house, foundations for engines and chimneys, and visits of inspection are made to a number of representative power-plants to enable the student to study their practical operation, and, when opportunity affords, visits are made to see power-plants in process of construction.

Two lectures and three drawing hours per week. Senior year.

Pre-requisites: M. E. 8, 9, 10, and 11; E. E. 5.

13. STEAM LABORATORY

PROFESSOR RITTER — Winter Term, 2 credits

The testing and calibration of pressure and vacuum gauges, steam-engine indicators, planimeters, etc.; indicator and dynamometer power measurements, valve-setting, and determination of mechanical efficiency of engines; test of auxiliary apparatus, etc.

Six laboratory hours per week. Senior year.

Taken concurrently with M. E. 8 and 9.

14. POWER-PLANT TESTING

PROFESSOR RITTER Spring Term, 1 credit

Capacity and efficiency tests of steam and gas-engine power-plants, together with complete reports on same. These tests as far as practicable will be conducted upon recently constructed power plants. The time allotted to this course, while somewhat variable, will approximate the equivalent of three laboratory hours per week. Senior year.

Taken concurrently with M. E. 12.

15. MANUFACTURE AND PROPERTIES OF IRON AND STEEL

PROFESSOR STEWART Spring Term, 3 credits

A study of (1) the Bessemer process, the theory and construction of gas producers, the open-hearth or Siemens process, and the production of steel castings; (2) the mechanical treatment of steel, including a study of the five leading types of rolling-mills, and the three processes for the manufacture of steel tubes; (3) the heat treatment of steel. Visits of inspection, on which reports are required, are made to a number of the great steel and tube mills in the vicinity of Pittsburgh.

Two lectures and either three laboratory hours or one afternoon inspection trip per week. Senior year.

Pre-requisites: Chemistry 6 or 9; M. E. 4; E. E. 5.

16. INSPECTION VISITS AND REPORTS

PROFESSOR STEWART 1 credit each term

Visits of inspection are made to shops, mills, factories, and power plants.

The University, being located in a vast field of industrial activity, probably the most extensive of its kind in the world, affords the student a rare opportunity for studying practical engineering in all its varied forms. After each visit the class meets with the instructor for conference and discussion. The student then prepares and submits a report, which not only provides him with a record of useful data, but also gives him an excellent exercise in technical composition.

The equivalent of one afternoon each alternate week. Senior year.

17. CURRENT ENGINEERING LITERATURE

PROFESSOR STEWART 1 credit each term

This course consists of written reviews and discussions of the current engineering literature pertaining to engineering practice.

One hour session each week, together with outside readings and written reviews.

18. THESIS

PROFESSOR STEWART

Winter and Spring Terms, 3 credits each term

The subject must be chosen and presented to the head of the department for approval during the latter part of the Fall term, Senior year.

This work will generally consist of the following: (1) the preparation of a bibliography of the important literature on the subject chosen; (2) the student's own investigations and deductions; and (3) the preparation of the thesis proper.

The thesis must be delivered in its final bound form to the head of the department not later than one week before date of Commencement.

Electrical Engineering

1. DYNAMO-ELECTRIC MACHINERY

PROFESSOR HARRIS — Fall or Winter Terms, 5 credits

A study of the fundamental principles of electricity and magnetism and their application to direct-current machinery.

Five lectures and recitations per week. Junior year.

Pre-requisites: Physics 13.

2. APPLIED ELECTRICITY

MR. DYCHE — Fall or Winter Term, 3 credits

This is a short course designed to meet the requirements of those not specializing in Electrical Engineering.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

3. APPLIED ELECTRICITY

PROFESSOR NESBIT — Fall or Winter Term, 3 credits

This course is similar to E. E., 2; but more comprehensive in scope. Designed with special reference to the needs of Mechanical Engineering students.

Two lectures, and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

4. APPLIED ELECTRICITY

PROFESSOR NESBIT — Spring or Summer Term, 3 credits

A continuation of Course E. E. 3.

Two lectures, and rectitations and three hours laboratory per week. Junior year.

5. APPLIED ELECTRICITY

PROFESSOR NESBIT Fall Term, 3 credits

A continuation of Course E. E. 4.

Two lectures and recitations and three hours laboratory per week. Senior year.

6. ALTERNATING-CURRENT THEORY

PROFESSOR HARRIS Spring or Summer Term, 5 credits

This course consists of a mathematical and graphical treatment of periodic functions as exemplified in alternating currents with the attendant phenomena of inductance, capacity, etc., singly and in combination.

Five lectures and recitations per week.

Pre-requisites: E. E. 1.

7. ALTERNATING-CURRENT MACHINERY

PROFESSOR HARRIS Fall Term, 3 credits

A mathematical and graphical treatment of alternating-current phenomena as applied to electrical machinery. A study is made of the different types of generators, motors, synchronous converters, etc.

Three lectures and recitations per week.

Pre-requisite: E. E. 6.

8. ALTERNATING-CURRENT MACHINERY

PROFESSOR HARRIS Winter Term, 3 credits

A continuation of Course E. E. 7.

Three lectures and recitations per week. Senior year.

9. ALTERNATING-CURRENT MACHINERY

PROFESSOR HARRIS Spring Term, 3 credits

A continuation of Course E. E. 8.

Three lectures and recitations per week. Senior year.

10. GENERAL ELECTRICAL ENGINEERING

MR. DYCHE Fall Term, 3 credits

This course is designed to cover the engineering and economic phases of the more special branches of Electrical Engineering, such as Electric traction, electric transmission of power, etc.

Three lectures and recitations per week. Senior year.

Pre-requisite: E. E. 6.

11. GENERAL ELECTRICAL ENGINEERING

MR. DYCHE — Fall Term, 3 credits

A continuation of Course E. E. 10.

Three lectures and recitations per week. Senior year.

12. GENERAL ELECTRICAL ENGINEERING

MR. DYCHE — Spring Term, 3 credits

A continuation of Course E. E. 11.

Three lectures and recitations per week. Senior year.

13. ELECTRICAL ENGINEERING DESIGN

MR. DYCHE — Fall Term, 2 credits

This course is intended to give the student practice in the application of the fundamental theory of electricity and magnetism to the calculation and proportioning of electrical machinery. A portion of the time is devoted to the study of the materials entering into electrical construction.

Six hours of design per week. Senior year.

Pre-requisite: E. E. 1.

14. ELECTRICAL ENGINEERING DESIGN

MR. DYCHE — Winter Term, 2 credits

A continuation of Course E. E. 13.

14a. ELECTRICAL ENGINEERING DESIGN

MR. DYCHE — Spring Term, 2 credits

A continuation of Course E. E. 14.

15. ELECTRICAL ENGINEERING LABORATORY

PROFESSOR HARRIS — Fall or Winter Term, 1 credit

This course is designed to furnish an experimental basis for the theory given in Course E. E. 1. It consists largely of elementary direct current machine tests.

Three hours laboratory per week. Junior year.

Taken concurrently with E. E. 1.

16. ELECTRICAL ENGINEERING LABORATORY

PROFESSOR HARRIS — Spring and Summer Terms, 1 credit

An experimental study of alternating current circuits, supplementing Course E. E., 6; with special reference to the effect of inductance and capacity, singly or in combinations. The measurement of alternating current single and polyphase power, and the determination and analysis of wave forms constitutes a portion of the work.

Three hours laboratory per week. Junior year.

Taken concurrently with E. E. 6.

17. ELECTRICAL ENGINEERING LABORATORY

PROFESSOR HARRIS — Fall Term, 2 credits

Advanced direct and alternating current testing of generators, motors, transformers, converters, rectifiers, etc., both commercial and for the purpose of investigation.

Six hours laboratory per week. Senior year.

Taken concurrently with E. E. 7.

18. ELECTRICAL ENGINEERING LABORATORY

PROFESSOR HARRIS — Winter Term, 2 credits

A continuation of Course E. E. 17.

Six hours laboratory per week. Senior year.

19. ELECTRICAL ENGINEERING LABORATORY

PROFESSOR HARRIS — Spring Term, 2 credits

A continuation of Course E. E. 18.

Six hours laboratory per week. Senior year.

20. ELECTRICAL ENGINEERING SEMINAR

PROFESSOR HARRIS AND MR. DYCHE — Three terms, 1 credit each term

The student and instructors meet regularly to discuss current engineering topics of interest. A part of the time is devoted to reviews and to reports and discussions of thesis matter by the Seniors.

One hour per week. Senior year.

Open to all students in Electrical Engineering.

21. INSPECTION VISITS AND REPORTS — Three terms

Frequent visits of inspection are made to the numerous manufacturing establishments, both electrical and mechanical, in this vicinity. The University is unusually fortunate in being located in this great manufacturing center, where the student sees the principles which he studies in the department daily put into practical operation. Among the many large electrical establishments accessible to the technical students, especial benefit is derived from the great Westinghouse works, to which the classes are welcome visitors at any time.

Required of all Seniors in Electrical Engineering.

22. ELECTRICAL ENGINEERING THESIS — 5 credits

A thesis is required of all candidates for the degree of B. S. in Electrical Engineering. This will consist of a report on original investigations and is intended to demonstrate the student's ability to think and act along independent lines. The subject must be approved by the professor in charge by January 15th, prior to Commencement and an outline of the results desired and method to be employed approved not later than April 1st.

23. ELECTRICAL ENGINEERING PROBLEMS

MR. DYCHE — Spring or Summer term, 2 credits

A course in the solution of practical Electrical Engineering Problems. Special emphasis is placed on the analysis of data and the solution from fundamental laws and principles without reference to special formulas.

Two recitations per week. Junior year.

Pre-requisite, E. E. 1. Taken concurrently with E. E. 6.

24, 25, 26. Practical Applications

PROFESSOR LINCOLN — Fall, Winter, and Spring, 2 credits

This course will consist in the solution of a selected list of problems involving the application of the theory in Electrical Engineering to Engineering practice.

Two recitations per week. Senior year.

Pre-requisites: E. E. 6, and Mech. 2.

Sanitary Engineering

1. HYDRO-MECHANICS AND HYDRAULICS

MR. SCHARFF — Spring or Summer Term, 4 credits

The equilibrium and pressure of liquids; the motion and work of fluids; the flow of water through orifices, over weirs, in pipes, and in canals; measurement of water power; and hydraulic machinery.

Four recitations and lectures per week. Junior year.

Pre-requisites: Mechanics 1, Mathematics 10.

2. HYDRAULIC LABORATORY

MR. SCHARFF — Spring or Summer Term, 1 credit

The experimental study of the flow of water through pipes, nozzles, and orifices over weirs, and in streams. Capacity and efficiency tests of hydraulic turbine pumps and motors.

Three laboratory hours per week. Junior year.

Taken concurrently with S. E. 1.

3. WATER EXAMINATION

PROFESSOR PHILLIPS Spring or Summer Term, 3 credits

See outline of course under Chemistry.

One lecture and six laboratory hours per week. Junior year.

Pre-requisites: Chemistry 21, 22, 23.

4. LABORATORY METHODS

PROFESSOR WALLGREN Fall Term, 2 credits

See outline of course under Biology 20.

Taken concurrently with advanced Bacteriology. Senior year.

5. HEATING AND VENTILATION

MR. SCHARFF Winter Term, 2 credits

A series of lectures dealing with the various systems and the fundamental mechanical principles involved in their application and design. Senior year.

6. SANITATION OF BUILDINGS

PROFESSOR WALLGREN Winter Term, 2 credits

See outline of course under Biology 22.

Taken concurrently with S. E. 5. Senior year.

7. WATER SUPPLY ENGINEERING

MR. SCHARFF Winter Term, 2 credits

The subject of municipal supply is taken up, dealing with the quantity required and the source of supply, the design of stand pipes, reservoirs, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of the water. Visits of inspection to various plants in the vicinity are made during the term.

One lecture and three hours designing per week. Senior year.

Pre-requisites: Mechanics 2, S. E. 1.

8. SEWERAGE AND SEWAGE DISPOSAL ENGINEERING

MR. SCHARFF Spring Term, 2 credits

The drainage of lands, the sewerage of cities and towns, the laws governing the disposal of sewage, and a study of the various systems of sewage treatment.

One lecture and three hours designing per week. Senior year.

Pre-requisites: Mechanics 2, S. E. 1.

9. MUNICIPAL SANITATION

DR. WALLGREN Spring Term, 3 credits

See outline of course under Biology 23.

One lecture and four laboratory hours per week. Senior year.

Taken concurrently with S. E. 7 and 8.

10. HYDRAULIC AND SANITARY ENGINEERING DESIGN

PROFESSOR KNOWLES OR ASSISTANT Winter Term, 3 credits

The design of structures connected with sanitary engineering, the development of water power, and irrigation projects, and supplementing course S. E. 7.

One lecture or recitation and six hours designing per week. Senior year.

Pre-requisites: S. E. 1, S. E. 3, C. E. 8.

11. HYDRAULIC AND SANITARY ENGINEERING DESIGN

PROFESSOR KNOWLES OR ASSISTANT Spring Term, 2 credits

A continuation of course S. E. 10, supplementing S. E. 8.

One lecture or recitation and three hours designing per week.

12. CURRENT TOPICS

PROFESSOR KNOWLES OR ASSISTANT 1 credit per term

Prepared presentation and discussion of various engineering and scientific problems of the day, particularly those pertaining to the public health.

One hour per week. Junior and Senior years.

13. VISITS OF INSPECTION

PROFESSOR KNOWLES OR ASSISTANT

Visits to various industrial plants, sanitary works, and engineering projects under construction. Reports covering each visit in detail are required.

One afternoon of each alternate week. Senior year.

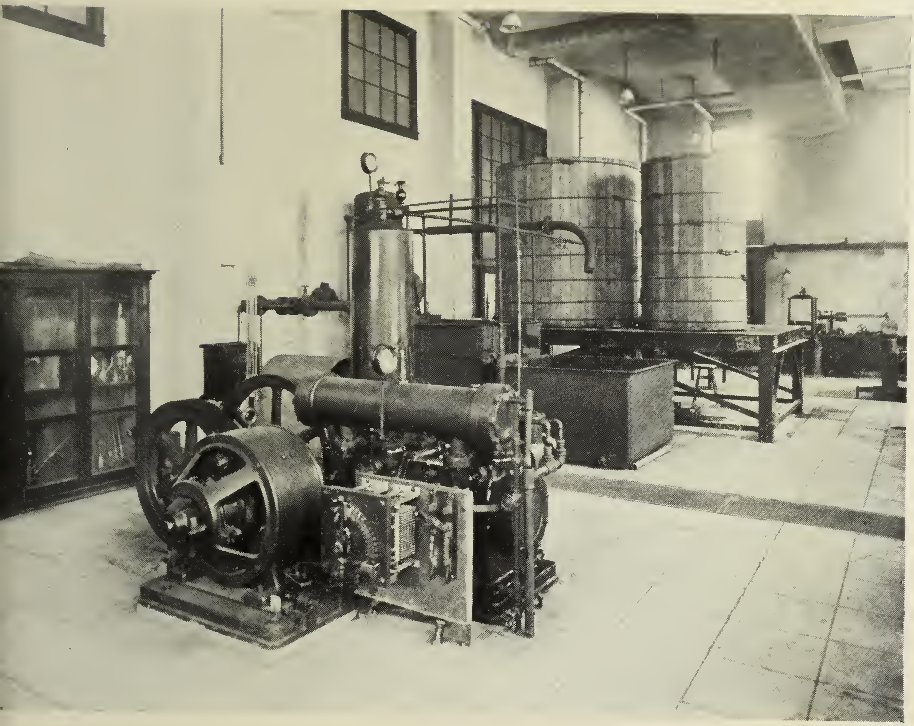
14. SANITARY ENGINEERING PRACTICE

PROFESSOR KNOWLES OR ASSISTANT

Fall, Winter and Spring Terms, 1 credit each

Discussion of the various aspects of current day sanitary problems as they present themselves to the practical engineer. Accompanied by assigned readings and reports.

One hour per week. Senior year, 3 terms.



Compressed Air and Hydraulics

15. THESIS

PROFESSOR KNOWLES OR ASSISTANT

Winter and Spring Terms, total 7 credits

All candidates for the degree of B. S. in S. E. must prepare a thesis embodying a large amount of original design or research in some branch of their profession.

Mechanical Railway Engineering

1. MATERIALS OF RAILWAY ENGINEERING

MR.——— Fall or Winter Terms, 2 credits

A study of the properties of materials used in the construction of locomotives, cars, shops, and power plants of railways.

One recitation and three drawing periods per week. Junior year.

2. OPERATING UNITS

MR.———— Spring or Summer Term. 6 credits

a. Locomotives—The principles involved in the design and operation of steam locomotives, the determination of power, type, and design to meet various operating conditions. Advantage of compounding, super-heating, etc.

b. Passenger Cars—The principles involved in the design and operation, type and construction of the vehicle, including trucks, brakes, etc.

c. Freight Cars—The general design and construction of the vehicle, including trucks, draft gears, required appliances for operation and use.

3. RAILWAY DESIGN

MR.————— Fall Term, 7 credits

a. Locomotive—The design of locomotives of various types, including boiler and appurtenances, engine, brakes and other required appliances.

b. Passenger Car Design. The principles involved in the design and construction of passenger cars covering the details of the vehicle, trucks, and other required appliances.

c. Freight Car Design. The principles involved in the design and construction of freight cars covering the details of the vehicle, trucks and other required appliances, including a study of standards of the M. C. B.

4. UTILIZATION OF LOCOMOTIVES AND CARS

MR.—————— Winter Term. 3 credits

a. Locomotives—A study of the Economic limits of speed and load, rating, train resistance, running and firing, stokers, dynamometer trials, etc.

b. Cars—Repair limits, resistance, inspection, running repairs, etc.

5. MAINTENANCE OF LOCOMOTIVES AND CARS

MR.———————— Spring Term. 4 credits

a. Locomotives—Economic limits of wear, proper maintenance of locomotives so that they will perform their work successfully at a reasonable cost. The organization, and arrangement of shop equipment, shop methods, repair of locomotive details and manufacture of material therefor. The receipt and shipment of material, accounting, including stock, consumption and requisitions. The inspection, reclamation and disposition of scrap. The maintenance of power in service, effects of various water, fuels and lubrication maintenance.

b. Passenger Cars—Organization, equipment, maintenance, and arrangement of the shop, shop methods, repair and manufacture of passenger car materials. Inspection and maintenance of cars in service.

c. Freight Cars. Organization, equipment and arrangement of equipment of shops including shop methods, repairs and manufacture of details, interchange, inspection, loading, running repairs and attention.

6. RAILWAY SHOP METHODS

MR.———————— Spring Term. 2 credits

Method of receiving and distributing the work, routing, handling material, special tools, tool room practice, etc.

7. FUNDAMENTALS OF RAILWAY PRACTICE

MR. D. F. CRAWFORD Senior Year. 1 credit

Discussion of the various aspects of current day practice as they should present themselves to the Superintendent of Motive Power.

8. CURRENT TOPICS

MR. ———————— 1 credit per term

Prepared presentation and discussion of the various engineering problems of Mechanical Railway Engineering by the students. Discussion by the instructors.

One hour per week. Junior and Senior years.

9. THESIS

MR. CRAWFORD Winter and Spring Terms. 7 credits

All candidates for a degree must prepare a thesis embodying original design or research in some branch of this profession.

Senior year.

Economics

3 E. ECONOMICS

ASSISTANT PROFESSOR CRAFER Fall or Winter Term, 3 credits

A brief resumé of economic theory. Discussion of practical economic problems; wages, interest, rent, currency, banking, taxation, trusts, tariff, socialism.

Open only to Engineering and special students.

Text-book and lectures.

10, 11. TRANSPORTATION

MR. FLOCKEN Fall and Winter Terms; 2 credits each term

The origin and growth of the American railways. Their present ownership and control. The organization of the railway company, and how it does its work. Railway financiering. The freight, passenger, express and mail service. Railway abuses. Regulation by the States and by the Federal Government. The Interstate Commerce Commission. Government ownership in the light of foreign experience. Railway rates and fares. Electric railway transportation. Ocean transportation. Ocean highways and seaboard terminals. The organization of ocean freight, passenger, express and mail service. The merchant marine. The question of subsidies. The river, lake and canal systems of the United States. The increasing importance of the inland waterways question. Text-book, lectures and assigned readings. Text-book, Johnston's *Elements of Transportation.*

13. MODERN INDUSTRIES

MR. FLOCKEN Fall Term; 2 credits

A study of the leading American industries, physiographic control, sources and supply of raw material, agricultural resources. Factors affecting the location of industry. Sources and application of power. Manufacturing methods, and factors affecting cost of production. Large scale versus small scale production. Internal commerce and foreign trade. Lectures, assigned readings and reports.

16. INDUSTRIAL MANAGEMENT

MR. FLOCKEN Winter Term; 2 credits

Advantages of various methods of business organizations and management. The internal management of the large business or plant and the differentiation of the duties of various departments. Profit-sharing schemes. Labor problems. Markets and methods of distribution. A study of actual industrial conditions by visits to the mills and shops of Pittsburgh, special attention being given to the handling of raw material, the arrangement of plant, and shipping facilities. Lectures, assigned readings reports, field work.

21. CORPORATION FINANCE

PROFESSOR HOLDSWORTH Fall Term; 2 credits

Types of business corporations. The genesis of the trust. The financial organization and management of the corporations. The promoter and the underwriting syndicate. The disposition of gross earnings and the provision of new capital. Charter, articles and by-laws. Stockholders' powers, rights and liabilities. Dissolution, receiverships and reorganizations. Lectures and text-book, assigned readings and reports. Text-books, Lough's *Corporation Finance.*

24. INVESTMENTS

PROFESSOR HOLDSWORTH. Winter Term; 2 credits

The general characteristics and merits of government and municipal bonds, and of railway, industrial, public service corporation, power and irrigation securities. The farm and city mortgage. How securities are purchased and marketed. The organization of the investment business. A study of fluctuations in bond and stock prices to determine the influence acting upon security values. Analysis of typical securities and railroad reports. Examination of savings banks and trust company holdings. Lectures assigned readings, and reports.

32. PUBLIC FINANCE

PROFESSOR HOLDSWORTH Winter Term; 2 credits

Federal taxation and expenditures. Budget systems of other countries. The justice and incidence of taxation. State and municipal taxation and expenditures. General property tax, income and inheritance taxes, the single tax, methods of assessment. City budgets and municipal accounting. A study of the fiscal and monetary history of the United States. Lectures and reports.

46. CONTRACTS AND SPECIFICATIONS

ASSISTANT PROFESSOR CRAFER Spring Term; 3 credits

In this course are presented the essential elements of a contract, the law pertaining thereto and parties who may contract. The consideration, discharge and remedies for breach of contract. Forms of proposals, specifications and illustrative examples of complete contracts and specification for various engineering projects are given.

Mathematics

5. Plane Trignometry

Professor Holder, Mr. Albert and Mr. Foraker   Fall Term; 3 credits

The subjects treated are the functions of angles, goniometry, trigonometric equations, solution of right and oblique triangles, with emphasis upon solution of examples of all kinds, involving both theory and practical applications.

Freshman year.

6, 7, 8, 9, 10.

Professor Holder, Mr. Albert, Mr. Foraker

Freshman Year, { Fall Term; 2 credits
Winter Term, 5 credits
Spring Term; 5 credits

Sophomore Year, { Summer or Fall Term; 5 credits
Winter or Spring Term; 4 credits

This is a course in Mathematics for students in Engineering and applied science as presented in Woods & Bailey's text.

Advanced Algebra, Analytical Geometry, Differential and Integral Calculus are combined in this one treatise.

The course extends throughout the Freshman year, and terminates at the end of the second term of the Sophomore year

Physics

11, 12, 13. General Physics

Professor Bishop and Mr. Ulrey

Fall, Winter, Spring and Summer Terms, 5 credits each term

The subjects covered in this course are the same as those in 1, 2, 3, but the calculus is extensively employed and special attention is given to the physical interpretation of mathematical equations.

A series of twelve lectures on the precision of measurements is given in connection with the laboratory work. Special attention is given in the laboratory to the method of the experiment and to the precision of the results.

Concurrent with Mathematics 9 and 10.

Required of all Engineering students. Sophomore year.

14, 15, 16. ADVANCED PHYSICAL LABORATORY

DR. WENRICH Fall, Winter, Spring and Summer Terms

This course deals primarily with electric measurements but includes experiments in measurement of high temperature, calorific power of fuels, and photometry. The experiments for each student are assigned according to the course he is pursuing.

Pre-requisite, Physics 11, 12, 13.

30, 31. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM

DR. WENRICH Winter and Spring Terms, 3 credits each term

A rigid Mathematical treatment of electricity and magnetism, including a study of Hertz's experiments and the present day theory of electromagnetism. Senior year.

Three lectures and recitations per week.

Pre-requisites, Mathematics 13.

CHEMISTRY

4, 5. 6. GENERAL INORGANIC CHEMISTRY

PROFESSORS SCHOLES AND C. W. CLARK; MESSRS. H. CLARK AND THOMAS

Fall, Winter, and Spring Term; 4 credits each term

A study of the metals and non-metals, principles, theories, and calculations. This course is intended for students in School of Engineering and School of Mines, who have not had chemistry in preparatory schools. Two lectures and two three-hour laboratory periods per week. A recitation is conducted at the beginning of each laboratory period.

7, 8, 9. GENERAL INORGANIC CHEMISTRY

PROFESSORS MACKAY, LIDDLE, AND PERKINS, MESSRS. PADGETT, THOMAS AND SHUMAKER Fall, Winter, and Spring Terms; 3 credits each term

A more advanced course than the preceding ones. This course is intended for students who have entrance credit in chemistry. One lecture, one recitation, and one three-hour laboratory period per week.

20, 21, 22. QUALITATIVE AND QUANTITATIVE ANALYSIS

PROFESSORS SILVERMAN, CORLISS AND PRATT, AND MR. SHUMAKER

Fall, Winter, and Spring Terms; 4 credits each term

A study of qualitative tests applied in detection of the more common elements and compounds followed by methods for separation of the various elements from each other. On completion of this work, the student is given instruction and practice in the exact or quantitative determination of some of the above elements by both gravimetric and volumetric methods. One lecture, one recitation and two three-hour laboratory periods per week. Pre-requisites:—1, 2, and 3; or 4, 5, and 6; or 7, 8, and 9.

40, 41. ORGANIC CHEMISTRY

PROFESSOR KOHMAN, ASSISTANT PROFESSORS SHIVELY AND CLAYTON, AND MESSRS. UHLINGER AND HOBBS.

Fall and Winter Terms, 3 credits each term

An introduction to the chemistry of the compounds of carbon. The student is given an opportunity to prepare a large number of typical carbon compounds and study their properties, reactions, and uses. Two lectures and two three-hour laboratory periods per week. Pre-requisites:— 1, 2, and 3; or 4, 5, and 6; or 7, 8, and 9.

46, 47, 48. ADVANCED ORGANIC CHEMISTRY

PROFESSOR PHILLIPS AND ASSISTANTS

Fall, Winter, and Spring Terms; 3 credits each term

A course intended to furnish opportunity for study along special lines. Students planning to take this course are requested to consult the professor in charge before registering in the subject. Pre-requisites:—20, 21, 22, 40, 41, 42, 50, 51, 52.

50, 51, 52. INTRODUCTORY PHYSICAL CHEMISTRY

PROFESSOR BROOKS Fall, Winter, and Spring Terms; 2 credits each term

A simple systematic study of modern theories and laws of chemistry with typical examples of their application. Two lectures per week. Prerequisite: 10, 11, 12, 20, 21, 22, 40, 41, and 42.

53, 54, 55. INTRODUCTORY PHYSICAL CHEMISTRY

Fall, Winter, and Spring Terms; 2 credits each term

Practical application of principles taught in preceding lecture course. This course may accompany the 50-51-52 or be taken subsequently. Two three-hour laboratory periods per week. Pre-requisites: same as 50.

100, 101, 102. TECHNICAL CHEMISTRY

MR. SHUEY Fall, Winter, and Spring Terms; 2 credits each term

Lectures upon the chemistry of manufacturing operations, having reference especially to chemical industries in the Pittsburgh region. Visits are made to the various chemical works in the vicinity, attendance on which is required. Pre-requisites: General Inorganic Chemistry and 40, 41, and 42.

3. GENERAL BIOLOGY.

PROFESSOR FETTERMANN AND ASSISTANT

Spring or Summer Terms, 3 credits

This course is designed to meet the needs of engineering students. During the first half of the course attention is given to the study of animal forms, including classification, distribution, habits, etc. The remainder of the term is given to the study of the morphology, classification and distribution of plants.

One lecture and four laboratory hours each week.

17, 18. BACTERIOLOGY

PROFESSOR FETTERMAN Fall and Winter Terms, 4 credits each term

This course is intended for students taking regular courses in Biology, and also those who may elect the work in Sanitary Engineering. Students are expected to become familiar with the methods of detection, isolation, and identification of various micro-organisms. Lectures are given on the classification, morphology, structure, reproduction and cultural characteristics of bacteria. Instruction is given on the principles of sterilization and disinfection, special emphasis being laid upon their practical application. In the latter part of the course special attention is given to the study of the bacteria occurring in soil, water and milk. The manner in which bacteria produce disease and the production of immunity are explained. Text-books: Jordan, Abbott, Muir, and Ritchie.

One lecture and six hours laboratory each week.

19. ADVANCED BACTERIOLOGY

PROFESSOR FETTERMAN Spring Term, 4 credits

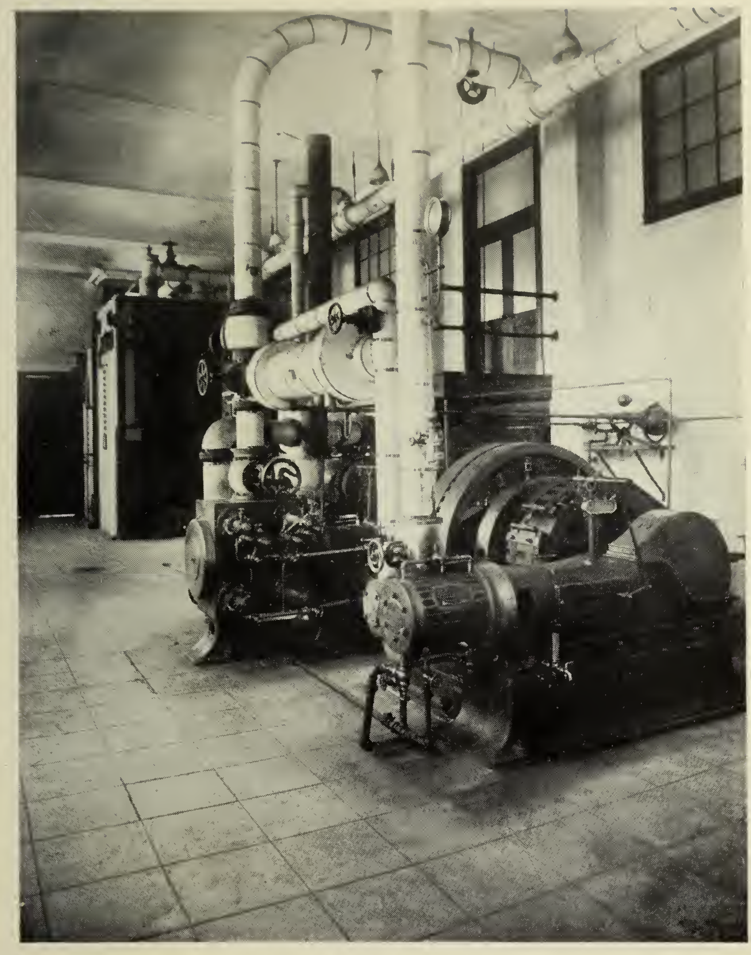
One lecture and six hours laboratory each week.

This course is the continuation of Course 18. The object is to impart a practical knowledge of the bacteriology of water, milk and sewage. Bacteria are studied in their relation to the dairy industry, and water supply, and also with reference to the part they play in the purification of sewage.

21. PERSONAL HYGIENE

PROFESSOR WALLGREN Fall Term, 2 credits

Lectures with the purpose of bringing out a general but accurate idea of the care and the operation of the human organism. They will touch



100 Horse Power Experimenting Steam Unit

on Anatomy, with a discussion of functions of the various systems, emphasizing effects of muscular fatigue and bad air upon the body, also the right use of body and methods of maintaining proper efficiency through choice of foods, recreation, rest, sleep, exercise, clothing and bathing.

PSYCHOLOGY AND PHILOSOPHY.

4. General Psychology for Technical Students

Professor White — One Term; 3 credits

This is an introduction to the study of human nature and the psychical forces behind material progress. Emphasis will be placed upon such problems as individual differences of character and intelligence, their causes and significance; the fundamental instincts, imitation, competition, co-operation; the many social relationships, suggestion, habit, memory, constructive imagination, the emotions, reason, will, etc.

Required of all students in the School of Engineering.

4. Principles of Philosophy

Professor White — Winter or Spring Term; 2 credits

Fundamental principles of philosophy, stages in their development, and present day applications.

GEOLOGY

Geology 1. General Geology

Professor Johnson — Fall Term; 3 credits

The general principles of geology exclusive of historical, structural and field geology. The probable origin and structure of the earth, volcanic and earthquake activities, destructive and constructive work of air and water, etc.

Geology 2. Stratigraphical (Historical) Geology

Professor Johnson — Winter Term; 3 credits

The ancient life-history of the earth. The successive continent outlines with the plant and animal life, characteristic of the times. The distribution in time and space of volcanic activity, coal deposits, etc.

General Mineralogy

Mineralogy 1.

Mr. Leighton — Spring or Summer Term; 2 credits each term

Designed primarily for Engineering students but open to anyone desiring a brief course in the subject. About 75 minerals and 20 rock types are studied. Special emphasis being made upon the identification and practical uses to the engineer.

Astronomy

1. General Astronomy

Assistant Professor Jordan — Spring or Summer Term; 3 credits

A course in Descriptive Astronomy, based upon Moulton's text-book. Required in C. E. Course. Junior year.

METALLURGY.

1, 2, 3. General Introductory Course

Professor Goodale — Fall, Winter, and Spring Terms, 5 credits each term

A general study of the manufacture and properties of the common metals. Three recitations or lectures and six hours laboratory work are required each week. Text-book for fall and winter, Austin's Metallurgy of the Common Metals; for spring, Stoughton's Metallurgy of Iron and Steel. Required of all students in the School of Mines.

19, 20, 21. Electro-Metallurgy

Professor Goodale — Fall, Winter , and Spring Terms, 5 credits each term

A careful study of the electrothermic and electrolytic processes applied to the recovery and refining of metals. Text-book, Thompson's Applied Electro-Chemistry. Three recitations and 6 hours laboratory work per week. Elective. The course is advanced work and requires a knowledge of chemistry, elementary electricity and metallurgy. This course takes up some of the most interesting and promising phases of metallurgy.

English Language and Literature

English 4 and 5. English Composition

Dr. Snow — Fall and Winter Terms, 4 credits

A study of the principles of composition, written and oral, with especial reference to exposition. Practice in writing and speaking; analysis of specimens of technical and scientific exposition.

Text-book: Earle's *Technical Writing.*

Required of Freshmen in the School of Engineering.

English 6. English Composition

Dr. Snow — Spring Term; 3 credits

A continuation of courses 3 and 4, the practice in oral composition being discontinued.

Three hours a week.

Required of Freshmen in the School of Engineering.

7. ARGUMENTATION AND DEBATING

PROFESSOR GIBBS AND MR. MILLER Summer or Fall Terms, 3 credits

The theory of argumentation, with practical exercises in brief-drawing and the composition and delivery of forensics.

Elective for students who have taken Courses 1, 2, 3 or 4, 5, 6. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15.)

15. ENGLISH LITERATURE

PROFESSOR GIBBS Summer or Fall Term, 3 credits

A study of selected masterpieces representing the successive periods of English literature, with a text-book to furnish a historical background and connections.

Required of Sophomores. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15. For their benefit both courses will be offered in the Fall and Summer terms.)

German Language and Literature

1, 2, 3. ELEMENTARY GERMAN

PROFESSOR BERGER Fall, Winter and Spring Terms, 3 credits each term

Elements of grammar and the reading of easy texts. Vos, *Essentials of German;* Hewitt's *German Reader;* Simple lyrics and ballads memorized. Gerstaecker, *Germeythausen;* Baumbach, *Der Schwiegersohn.*

Open to Freshmen who have satisfied requirements for admission by offering French or Latin if they wish to take up German as the required modern language. Elective for Sophomores.

4, 5, 6. INTERMEDIATE COURSE

PROFESSOR BERGER Fall, Winter and Spring Terms, 3 credits each term

Review of Grammar. Drill in translating from English into German and practice in conversation. Memorizing of simple prose and poetry. Wesselhoeft: *German Exercises.* Wenckebach: *German Composition.* Wildenbruch: *Das edle Blut.* Gerstæcker: *Irrfahrten.* Hatfield: *German Lyrics and Ballads.*

Classical German Authors. Selections from the following lists of texts: Schiller: *Maria Stuart.* Gœthe: *Hermann und Dorothea;* Lessing: *Minna von Barnhelm.* German is used extensively in conducting class work.

Required of all Freshmen satisfying entrance requirements in German who elect to continue it.

7, 8, 9. TECHNICAL GERMAN

DR. BURDICK

Summer or Fall Terms, 3 credits each term
Winter or Spring Terms, 3 credits each term
Summer Term, 3 credits

Syntax. Prose Composition, conversation. Freytag: *Soll und Haben, Aus dem Jahrhundert des grossen Krieges.* Whitefield and Kaiser: *A Course of Commercial German.*

Required of all Sophomores in Engineering courses, who elect German in Freshman year, having satisfied entrance requirements in this language. Elective for students who have taken previous courses.

Romance Languages and Literatures

1, 2, 3. ELEMENTARY FRENCH

PROFESSOR HARRY Fall, Winter and Spring Terms, 3 credits each term

Grammar, composition and easy reading, with thorough drill in pronunciation and practice in speaking.

Open to Freshmen who have satisfied requirements for admission by offering German or Latin, if they wish to pursue French as the required modern language.

4, 5, 6. INTERMEDIATE FRENCH

PROFESSOR HARRY Fall, Winter and Spring Terms, 3 credits each term

Extensive reading in selected works of Modern French writers. Fraser and Squair's Grammar completed. Advanced prose composition. French conversation. The following texts are read: Daudet, *Contes Choisis;* Maupassant, *Contes;* Coppee, *On Rend l'Argent;* Augier, *Le Gendre de M. Poirer;* George Sand, *La Mare au Diable;* Canfield; French Lyrics.

Required of all Freshmen satisfying entrance requirements in French who elect to continue it.

7, 8, 9. TECHNICAL FRENCH

PROFESSOR HARRY Summer or Fall Term, 3 credits each term
Winter or Spring Term, 3 credits each term
Summer Term, 3 credits

Herdler's Scientific Reader and other works of similar character will be read. The purpose of this course is to enable students to use Scientific French readily and is primarily designed for students in Engineering courses who have a good reading knowledge of ordinary French prose.

30, 31, 32. ELEMENTARY SPANISH

DR. BOYCE Fall, Winter and Spring Terms, 3 credits each term

Hill's and Ford's Spanish Grammar, reading, composition, conversation. Bransby's *Spanish Reader;* Selga's *La Mariposa Blanca;* Galdo's *Dona Perfecta; Tamayo Lo Positivo;* Giese's *Spanish Anecdotes.*

35, 36, 37. COMMERCIAL SPANISH

DR. BOYCE Fall, Winter and Spring Terms, 3 credits each term

Reading of Commercial Spanish. Commercial correspondence. Conversation. The vocabulary of every day life is emphasized.

40, 41, 42. ELEMENTARY ITALIAN

MR. PIERRUCCI Fall, Winter and Spring Terms, 3 credits each term

Elementary grammar, dictation, reading, memorizing, conversation, and easy composition. Motti's Elementary Italian Grammar. Cattaneo, Italian Reader. DeAmicis, Cuore. Other selections from modern authors will be assigned by the instructor.

43, 44, 45. ITALIAN, INTERMEDIATE COURSE

MR. PIERRUCCI Fall, Winter and Spring Terms, 3 credits each term

Study of Italian Grammar in Italian. Conversation and advanced prose composition. Italian literature of the XVIII and XIX centuries. Selected readings and brief lectures in Italian. Manzoni, I Promessi Sposi, will be read in full.

Open to students who have taken the course in Elementary Italian.

SPECIAL LECTURES AND LECTURERS.

One of the important features of the work in the School of Engineering is the number of special lectures which we are able to secure, due to our location in the industrial center. The students in the School of Engineering as a body meet once a week to listen to discussions of topics of general interest to engineers. Among those who have lectured during the past year are the following:

"Electricity in the Home", Wm. A. Easton, Westinghouse Electric & Manufacturing Company.

Mr. S. P. Grace, General Superintendent, Bell Telephone Company. Illustrated.

"Cement", T. H. Bates, U. S. Government.

"Power Troubles", J. W. Welsh, E.E., Pittsburgh Railways Company.

"Sunken Bell", "Gerhart Hauptman's", Rudolph Tombo, Jr., Assistant Professor of Germanic Languages and Literature at Columbia University.

"Signal Systems", L. F. Howard, C.E., Union Switch & Signal Company.

"Power Troubles", Joe W. Welsh, E.E., Pittsburgh Railways Company.

"Some Things an Engineer Ought Not To Do", George H. Neilson, Secretary and General Manager for the Braeburn Steel Company.

"Cork Industry", H. W. Prentis, Armstrong Cork Company.

Mr. Charles M. Bregg, Dramatic Critic for Gazette Times.

"Heat Insulation", H. W. Prentis, Armstrong Cork Company.

"Vacuum System of Steam Heating", James A. Donnally, C.E., New York.

"The Diesel Engine", A. F. Nesbit.

"Recent Bridges", F. J. Affelder, Sales Manager, American Bridge Company, Pittsburgh, Penna.

J. M. Searles, City Smoke Inspector.

"Motor Applications", D. S. Bowman, Commercial Engineer, Westinghouse Electric & Manufacturing Company.

"Price Making", R. Seybold, Westinghouse Electric & Manufacturing Company.

"Development of Industrial Control", Paul Caldwell, General Electric Company.

"Yucatan", Henry Hornbostle, Ph.B., Special Lecturer on Architecture.

ALUMNI REGISTER
OF THE
SCHOOL OF ENGINEERING
OF THE
UNIVERSITY OF PITTSBURGH

ENGINEERING ALUMNI REGISTER

This Register contains a complete list of all graduates of the University who took a degree in engineering, except in the School of Mines.

The addresses and occupations have been corrected in accordance with information furnished up to February 1st, 1912.

The Dean has been assisted in the preparation of this Register by Emeritus Professor Carhart, Professors Frost, Stewart and Smith.

OPPORTUNITIES FOR APPOINTMENTS

The School of Engineering receives inquiries from time to time for men to fill positions in engineering work. These positions are often for graduates who have had a few years' experience, and many times we are unable to fill them owing to the fact that we do not have the addresses of all the graduates, some of whom may wish to consider such positions.

If you employ engineers, and at any time have a demand for men of experience, or for undergraduates without experience, we should be glad to have you communicate with the Dean of the School of Engineering.

ABBREVIATIONS

*Deceased.
C. E. Civil Engineer.
M. E. Mechanical Engineer.
E. E. Electrical Engineer.
Ch. E. Chemical Engineer.
S. E. Sanitary Engineer.
Eng. Student for a time in engineering.

1846

*Morley, Isaac, C. E.
*Stilley, Edward J., C. E.

1858

*Marshall, Thomas F., C. E.

1870

Reed, James, C. E.

1873

*Hartupee, William Dilworth, M. E.

1874

Smith, William R., Eng.
*Stewart, Charles A., Eng.

1875

Neeld, Almos D., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.
Trimble, Robert, Eng., Chief Engineer, Maintenance of Ways, Pennsylvania Co., Union Station, Pittsburgh, Pa.

1876

McCullough, Ross, C. E.

1877

*Canfield, Morris Pierpont, C. E.

1878

Jordao, Francisco Rodigues, C. E., San Paulo, Brazil.
Sickman, Albert F., C. E., Hydraulic Engineer, Holyoke Water Power Co., Holyoke, Mass.

1879

Gilfillan, Alexander, C. E.
Keller, Charles, C. E., Retired, 117 Biddle Ave., Wilkinsburg, Pa.
Swan, Robert, C. E., Contractor, T. T. Gillespie Company, Westinghouse Bldg., Pittsburgh, Pa.

1880

Camp, James McI., C. E., Chief Chemist, Carnegie Steel Co., Duquesne, Pa.

1881

Danse, Leopold O., C. E.

1883

Coffin, William C., C. E., Structural Engineer, Jones & Laughlin Co., Pittsburgh, Pa.

1884

Gray, James C., C. E.
McCabe, Junius, D., C. E., 341 Fourth Ave., Pittsburgh, Pa.

1885

*Bray, Harry E., C. E.
Buente, Charles F., C. E.
Carey, Joseph F., C. E., 4241 University Boulevard, Santiago, California.
Mesta, George F., C. E., President Mesta Machine Co., Pittsburgh, Pa.
Stewart, Reid T., C. E., Head of Department of Mechanical Engineering, University of Pittsburgh; Consulting Engineer, National Tube Co., Pittsburgh, Pa.

1886

McKean, Robert Andrews, C. E., Superintendent Structural Dept., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Patterson, Peter C., Eng., Chief Engineer, National Tube Co., Frick Bldg., Pittsburgh, Pa.

Rosewell, Joseph T., C. E.

1887

Barbour, George Hurlburt, C. E., Asst. Chief Mechanical Engineer, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

Lyons, James K., C. E., Civil Engineer, Gas Power Engineering Corporation, Pittsburgh, Pa.

Nicholson, John H., Eng., Manufacturer, 3rd Vice President, Shelby Steel Tube Co., Frick Bldg., Pittsburgh, Pa.

Stoner, Frank R., Eng., Attorney, 1307 Berger Bldg., Ptitsburgh, Pa.

Taylor, Samuel E., C. E., Civil and Mining Engineer, Pittsburgh, Pa.

1888

Bright, Frederick, C. E., Checking Structural Drawings, Empire Bridge Co., Elmira, N. Y.

Crider, James L., C. E., Chief Engineer, New York, Westchester and Boston Ry. Co., 65 Beaver St., New York City.

Gilfillan, George A., C. E., Consulting Engineer, 341 Fourth Ave., Pittsburgh, Pa.

Jenkins, Jenks B., C. E., Asst. Engineer, Baltimore & Ohio R. R., Mt. Royal Station, Baltimore, Md.

McCormick, Roscoe T., C. E., Manager of Sales, Petroleum Iron Works Co., Irwin, Pa.

Smith, Richard Lesnett, C. E., Consulting Engineer, Smith & Lewis, 1444-5-6 Oliver Bldg., Pittsburgh, Pa.

1889

Barrett, John Henry, C. E., Consulting Engineer, 212 Fulton Bldg., Pittsburgh, Pa.

1890

Ehlers, Charles W., C. E., Asst. Engineer, Bureau of Surveys, Pittsburgh, Pa.

*Herron, George K., C. E.

Johnston, John P., C. E., General Manager, The New York Engine Co., Watertown, New York.

Langenheim, Gustave C., 403 Times Bldg., Pittsburgh, Pa.

1891

Carhart, Charles F., C. E., Salesman, Citizens Wholesale Supply Co., Columbus, Ohio.

Hays, James W., C. E., Civil Engineer, 55 Schmidt Bldg., Pittsburgh, Pa.

Liggett, Dudley S., C. E., Real Estate & Insurance, 705 Peoples Bank Bldg., Pittsburgh, Pa.

Mollenhauer, Frederick H., C. E., Engineer, Monongahela Nat. Gas Co., Pittsburgh, Pa.

McCabe, William P., C. E., Structural Steel Engineer, W. N. Kratzer & Co., Smallman St., Pittsburgh, Pa.

McGrew, John, C. E., John & Edward McGrew, Civil Engineers, 818 Empire Bldg., Pittsburgh, Pa.

1892

Cooper, Frederick M., C. E., Coraopolis, Pa.

Davis, Charles W., M. E., Sales Manager, Standard Underground Cable Co., Pittsburgh, Pa.

Donaldson, Joseph T., C. E., Civil Engineer, Riter-Conley Mfg. Co., Water St., Pittsburgh, Pa.

Emmons, Charles DeMoss, C. E., General Manager, Ft. Wayne & Wabash Valley Traction Co., Ft. Wayne, Indiana.

Isenthal, Leo Ralph, C. E., Railway Constructor and Operator, Stern & Silverman Inc., 605 Land Title Bldg., Philadelphia, Pa.

Kunkle, Charles E., C. E., Chief Draftsman, Jones & Laughlin Steel Co., Pittsburgh, Pa.

Miles, J. Walter, C. E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

McGrew, Anson B., C. E., U. S. Asst. Engineer. United States Engineer.

Nagle, James C., C. E.

Purdy, William G., C. E., Office, Farmers Bank Bldg., Pittsburgh, Pa.

Rhea, Frank C., C. E.

Rose, George R., C. E., Merchant, 539 Lincoln Ave., Bellevue, Pa.

*Smith, John F., C. E.

Wittmer, George, Jr., M. E., Asst. General Manager, American Natural Gas Co., 407 Park Bldg., Pittsburgh, Pa.

1893

Bratt, Berton, M. E.

*Bright, Paul, C. E.

Calvert, George H., C. E., Attorney, Blakeley & Calvert, Oliver Bldg., Pittsburgh, Pa.

Douthitt, Philip, C. E., Civil Engineer, 1347 Bluff St., Pittsburgh, Pa.

Elliott, James R., C. E., Consulting Engineer, Arlington Station, California.

*Flack, Charles A., C. E.

Godfrey, Edward, C. E., Engineer with R. W. Hunt Co., Monongahela Bank Bldg., Pittsburgh, Pa.

Lauman, Walter H., C. E., 1006 Carnegie Bldg., Pittsburgh, Pa.

Ridinger, Charles W., E. E., President, Iron City Engineering Co., Grant St., Pittsburgh, Pa.

Sapp, Edward H., C. E., Civil Engineer, New York Shipbuilding Co., Camden, N. J.

Shaler, Edward C., C. E., Assistant Engineer, Surface Lines, Brooklyn Rapid Transit Co., 85 Clinton St., Brooklyn, N. Y.

Scott, Walter C., Eng., Engineer with National Tube Co., 554 Frick Annex, Pittsburgh, Pa.

Swan, John, Jr., Eng., 1105 Allegheny Ave., N. S., Pittsburgh, Pa.

Wylie, Thomas B., Eng., Mechanical Engineer, Equitable Water Co., Water St., Pittsburgh, Pa.

1894

Affelder, Louis J., C. E., Division Contracting Manager, American Bridge Co., of New York, Frick Bldg., Pittsburgh, Pa.

Brown, Robert C., C. E.

Clark, Milnor P., E. E., Mechanical Engineer with National Tube Co., Frick Annex, Pittsburgh, Pa.

Dammond, William H., C. E., Civil Engineer, 86 Lee's Hill St., Sneinton, Nottingham, England.

Douglass, Robert McC., Eng., 306 Fourth Ave., Pittsburgh, Pa.

Dunlap, John H., Eng., Manufacturer, John Dunlap Co., Pittsburgh, Pa.

Gray, Guy McC., C. E., Superintendent Motive Power, Bessemer & Lake Erie R. R., Greenville, Pa.

Hamilton, Alfred R., Eng., Coal Trade Bulletin, Park Bldg., Pittsburgh.

Howat, John B., Eng., President, Sharon Hardware Mfg. Co., Sharon, Pa.

Kehew, Everett E., Eng., Paying Teller, Keystone National Bank, Pittsburgh, Pa.

McEwen, John A., M. E., Contracting Engineer, Pittsburgh, Bridge & Iron Works, Rochester, Pa.

Neubert, Walter P., E. E., Asst. Engineer, Union Switch & Signal Co., Swissvale, Pa.

Parkinson, David I., E. E., 323 Fourth Ave., Pittsburgh, Pa.

*Price, Jesse B.. C. E.

1895

Dickey, Alfred C., C. E., Teacher of Mathematics, Shadyside Academy, Pittsburgh, Pa.

DuBarry Dudley D., Eng., Draftsman, Jones & Laughlin Steel Co., Pittsburgh, Pa.

DuBarry, Harry F., Eng., 5816 Baum St., Pittsburgh, Pa.
Fawcett, Lewis B., Eng., Treasurer, Cheat Haven Coal & Coke Co., Machesney Bldg., Pittsburgh, Pa.
Gerwig, Frederick H. N., M. E., Asst. Supt., Carrie Furnaces, Carnegie Steel Co., Rankin, Pa.
Harrer, Henry, E. E., Farmer, Belgrade, Montana.
Hay, Paul Liscomb, M. E., Mechanical Engineer, Samuel Hay's Sons, 1408 Keenan Bldg., Pittsburgh, Pa.
Hoerr, Alexander L., M. E., Steam and Hydraulic Engineer, National Tube Co., McKeesport, Pa.
Hunter, Percy E, M. E., Independent Bridge Co., North Side, Pittsburgh, Pa.
Kirker, Albert H., M. E., Draftsman, U. S. Radiator Corporation, West Newton, Pa.
Macfarren, Walter W., M. E., Mechanical Engineer, Pittsburgh, Pa.
McKee, D. Gregg, E. E., Treasurer, Pittsburgh Trust Co., Fourth Ave., Pittsburgh, Pa.
Nevin, William C., Eng., 431 Fifth Ave., Pittsburgh, Pa.
Richey, Charles W., C. E., Master Carpenter, Pennsylvania R. R. Co., East Liberty Station, Pittsburgh, Pa.
Steel, Gardner, Eng.
Trees, Joseph C., M. E., President, Benedum-Trees Oil Co., Union Bank Bldg., Pittsburgh, Pa.
Wilson, Henry M., M. E., Pittsburgh Representative, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa.

1896

*Beckert, Jacob C., M. E.
Boyd, Thomas W., Eng., Architect, Boyd & Stewart, Century Bldg., Pittsburgh, Pa.
Dietz, Louis A., C. E., Engineer, Dietz Engineering Co., 50 Church St., New York City.
Dunnells, Clifford G., Eng., Civil Engineer, Chas. Bickel, Architect, May Bldg., Pittsburgh, Pa.
Elverson, Howard W., Eng., General Foreman, Miscellaneous Dept., Pressed Steel Car Co., Pittsburgh, Pa.
Farrar, Silas Clarke, M. E., Mechanical Engineer, Bureau of Water, 532 Oliver Bldg., Pittsburgh, Pa.
Francies, William H., C. E., Asst. Superintendent, County Roads, Court House, Pittsburgh, Pa.
Glaubitz, Hugo, C. E., General Superintendent Water Works and Chemical Dept., London, Ont.
Harloy, James Hayward, Jr., C. E., Civil Engineer, Susquehanna Power Co., Darlington, Md.

Horner, Joseph T., E. E., 910 Sherman Ave., N. S., Pittsburgh, Pa.

House, Edward B., Eng., Professor of Civil and Irrigation Eng., Colorado Agricultural College, Ft. Collins, Colorado.

Hunter, H. M. L., M. E., Salesman, Carnegie Steel Co., Cincinnati, Ohio.

Jack, Wilbur Lee, Eng., 55 Water St., Pittsburgh, Pa.

McCullough, Harvey V., C. E., W. T. McCullough Electric Co., 2315 Penn Ave., Pittsburgh, Pa.

McMaster, Robert T., C. E., Inspecting Engineer, Pittsburgh & Lake Erie R. R., Pittsburgh, Pa.

Neeld, Charles M., C. E., General Contractor, Oliver Bldg., Pittsburgh, Pa.

Neely, Wm. R., M. E., Secretary, Best Mfg. Co., Pittsburgh, Pa.

Noble, Howard A., Eng., Mechanical Engineer, 1417 Farmers Bank Bldg., Pittsburgh, Pa.

Porter, James C., Eng.

Rust, Frank, Jr., Eng., 1341 Kentucky Ave., Pittsburgh, Pa.

Spencer, Stewart C., Eng., Horticulturist, Ocean Springs, Mississippi.

Strassburger, Dan S., C. E., Merchant, Atlantic Glass Co., 225 Water St., Pittsburgh, Pa.

Tanner, J. Roy, Eng., Asst. General Manager, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa.

Wittmer, Thomas, Eng., Civil Engineer, American Natural Gas Co., Park Bldg., Pittsburgh, Pa.

1897

Bennett, Edward, E. E., Professor of Electrical Engineering, University of Wisconsin, Madison, Wis.

Biggs, George W., Jr., C. E., Chief Engineer, American Water Works & Guarantee Co., Pittsburgh Bank for Savings Bldg., Pittsburgh, Pa.

Bradshaw, William M., E. E., 400 Whitney Ave., Wilkinsburg, Pa.

Bright, Graham, E. E., Electrical Engineer, Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.

Davis, Alfred C., E. E., Superintendent, American Mfg. Concern, Falconer, New York.

Dornbush, Charles C., C. E., Designer and Estimator, Jones & Laughlin Steel Co., Pittsburgh, Pa.

Francies, Edward S., C. E.

Hoopes, Henry T., E. E., Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa.

Johnston, Edward VanDeusen, M. E., Penn and Fairmount Aves., Pittsburgh, Pa.

Kier, Samuel M., E. E., Manufacturer, Kier Fire Brick Co., Oliver Bldg., Pittsburgh, Pa.

Kiser, Alexander B., E. E., Supt. Electrical Equipment, Pittsburgh Coal Co., Oliver Bldg., Pittsburgh, Pa.
Liggett, Sidney S., Eng., Real Estate and Insurance, 705 Peoples Bank Bldg., Pittsburgh, Pa.
Morganstern, Ralph M., E. E., Electrical Engineering Contractor, 325 Second Ave., Pittsburgh, Pa.
Plecker, Mayburt, C. E.
Rankin, Harry H., C. E., Civil and Mining Engineer & Contractor, 1321 Park Bldg., Pittsburgh, Pa.
Shrom, William G., M. E., Salesman, Allis-Chalmers Co., 814 Frick Bldg., Pittsburgh, Pa.
Trimble, Alexander F., C. E., Division Engineer, Erie Railroad, Dunmore, Pa.
Wilde, Herbert K., C. E., 712 E. Diamond St., N. S., Pittsburgh, Pa.
Wooldridge, Charles L., Eng., Mechanical Engineer, T. A. Gillespie Co., Westinghouse Bldg., Pittsburgh, Pa.

1898

Butz, Harry A., E. E.
Cochran, Charles E., C. E., Draftsman, Penn Engineering Works, New Castle, Pa.
Drexler, Louis A., Eng., Bethany Beach, Delaware.
DeVore, Henry C., M. E., 501 W. Main St., Monongahela, Pa.
Goldie, William, Jr., M. E., Goldie Mfg. Co., Bay City, Michigan.
Hindman, Wm. S., C. E, Hindman & Henderson, Civil and Contracting Engineers, 345 Fourth Ave., Pittsburgh, Pa.
Hurst, Oliver C., M. E., General Insurance, Machesney Bldg., Pittsburgh, Pa.
Kelly, Henry E., E. E., Tionesta, Forest Co., Pa.
Riley, Albert D., M. E., 114 Liberty Ave., New York.
Slaymaker, Philip K., M. E., Asst. Professor of Applied Mechanics and Machine Design, University of Nebraska, Lincoln, Nebraska.
Smith, J., Hammond, E. E., Head of Department of Civil Engineering, University of Pittsburgh, Pittsburgh, Pa.
Sperling, George C., C. E., Mechanical Draftsman, Midvale Steel Co., Philadelphia, Pa.
Taylor, John L., C. E., Engineer, American Bridge Co., Frick Bldg.,

1899

Biggert, Florence C., M. E., Mechanical Engineer, United Engineering & Foundry Co., 2318 Farmers Bank Bldg., Pittsburgh, Pa.
Collins, Palmer, M. E., Mechanical Engineer, American Steel & Wire Co., Frick Bldg., Pittsburgh, Pa.
Gray, Arthur E., M. E., 5724 Bartlett St., Pittsburgh, Pa.

Hanna, Roscoe E., Eng., Clerk Philadelphia Co., 435 Sixth Ave., Pittsburgh, Pa.

Irwin, Lee S., Eng., Mfg. of Lamps and Sheet Metal Products, East Lacock St., North Side, Pittsburgh, Pa.

*Miller, Ralph R., C. E.

Mould, Edmund F., Eng.

Murry, John S., C. E., 1108 Ross Ave., Wilkinsburg, Pa.

Palmer, George B., Eng., Engineer, Right of Way, Pennsylvania Lines West, 1107 Union Station, Pittsburgh, Pa.

Pennington, Harley, M. E., Mechanical Engineer, United Engineering & Foundry Co., 2325 Farmers Bldg., Pittsburgh, Pa.

Peterson, Albert A., Eng., Civil Engineer, 6945 Hamilton Ave., Pittsburgh, Pa.

Price, Philip W., C. E., Civil Engineer, County Engineer Office, Court House, Pittsburgh, Pa.

Reid, Samuel, C. E., Civil Engineer, Pittsburgh & Lake Erie R. R., Beaver Falls, Pa.

Roberts, Elijah R., E. E., Illuminating Engineer, Allegheny County Light Co., Pittsburgh, Pa.

*Rogaliner, Morris L., C. E.

*Russell, John W., E. E.

Thomas, Edwin L., Eng.

Woodson, Howard D., C. E., Structural Engineer, Office of Supervising Architect, Treasury Department, Washington, D. C.

Wuth, William B., Eng., 830 Sheridan Ave., Pittsburgh, Pa.

1900

Bauer, George F., C. E., Civil Engineer, 156 W. Washington Ave., Rochester, Pa.

Blackadore, John, C. E., Real Estate, Frankstown Realty Co., Frankstown Ave., Pittsburgh, Pa.

Coates, Edward S., E. E.

Collins, Frank S., M. E., Best Mfg. Co., Pittsburgh, Pa.

Fisher, Chester G., M. E., President, Scientific Materials Co., 771 Forbes St., Pittsburgh, Pa.

Gerber, Christian G., C. E., Civil Engineer, 1519 Park Bldg., Pittsburgh, Pa.

Goehring, Chas. P., C. E., Chief Engineer, Pittsburgh, McKeesport & Westmoreland Ry. Co., 502 Fifth Ave., McKeesport, Pa.

Hammer, Howard G., Eng., Fire Insurance, 401 Peoples Bank Bldg., Pittsburgh, Pa.

Hunter, Samuel K., C. E., 366 Marshall Ave., Pittsburgh, Pa.

Lambie, Charles S., C. E., President, C. S. Lambie Co., Pittsburgh, Pa.

Layng, Frank R., Eng., Engineer of Track, Bessemer & Lake Erie R. R., Greenville, Pa.

Munroe, Chas. L., Erecting Engineer, West Penn Boiler Wks., 23rd and Smallman Sts., Pittsburgh, Pa.
O'Hagan, Charles F., C. E., Structural Engineer, Wm. B. Scaife & Sons, 221 First Ave., Pittsburgh, Pa.
Orr, Almer H., Eng,. General Agent, Atlantic Coast Despatch, 1019 Bessemer Bldg., Pittsburgh, Pa.
Roessing, Frank M., C. E., Engineer and Contractor, Ferguson Bldg., Pittsburgh, Pa.
Smith, William Acheson, C. E., Vice President, International Acheson Graphite Co., Niagara Falls, N. Y.
Ward, Chas. A., M. E., 772 Lemington Ave., Pittsburgh, Pa.

1901

Barr, J. Toner, Eng., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.
Benner, Jacob Wesley, M. E., Steam Engineer, Homestead Steel Works, Carnegie Steel Co., Munhall, Pa.
Cullers, William H., C. E., Chief Engineer, Northwest Steel Co., Portland, Oregon.
DesIslets, John C., Eng., Pressed Steel Car Co., Broad St., New York.
Earl, Howard A., C. E., Draftsman, Fort Pitt Bridge Co., Canonsburg, Pa.
Hansen, Wm. K. W., M. E., General Supt., Hockensmith Wheel & Mine Car Co., Penn Station, Pa.
Herr, Andrew G., Eng., Structural Draftsman, Springdale, Pa.
Hillman, John J., Jr., Eng., Oliver Bldg., Pittsburgh, Pa.
Hockensmith, Wilbur D., General Manager and 1st Vice President, Hockensmith Wheel and Mine Car Co., Penn Station, Pa.
Johnson, Frank E., Eng.
Knopf, Julius R., M. E., 1224 Frick Bldg., Pittsburgh, Pa.
Miller, Frank Forest, M. E., Mechanical Engineer, Star Drilling Co., Akron, Ohio.
Miller, John A. W., M. E., Asst. Superintendent, Gas Department, Pittsburgh Plate Glass Co., Ford City, Pa.
Mitchell, Wm. H., M. E., Inspector, The Niagara Falls Power Co., Bethlehem Steel Co., South Bethlehem, Pa.
Moody, William Falley, Eng. Paper Merchant, S. Croton Avenue, New Castle, Pa.
Murdock, Wm. H., Eng., Contractor, Pittsburgh, Pa.
Paul, Earl W., E. E., Earl W. Paul, Electrical Engineers, 810 Phipps Power Bldg., Pittsburgh, Pa.
Ransom, George W., E. E., 224 S. St. Clair St., Pittsburgh, Pa.
Watt, Herman E., M. E., Asst. Supt., South Pittsburgh Water Co., 231 Southern Ave., Mt. Oliver, Pa.

1902

Hoffman, John W., Eng., Paying Teller, Pittsburgh Trust Co., Box 596, Pittsburgh, Pa.

Brinker, Wm. E., Eng., Real Estate, Colonial Bldg., Wilkinsburg, Pa.

Chalfant, Frederick B., C. E., Assistant Engineer, Bureau of Surveys, Pittsburgh, Pa.

Dougherty, L. H., C. E., Ingram, Pa.

Eisenbeis, Walter H., E. E., Engineering Salesman, Canadian Westinghouse Co., Toronto, Canado.

Farmer, J. McD., Eng., Canonsburg, Pa.

Fullerton, Hugh L., E. E., Electrical Engineer, Allegheny County Light Co., Pittsburgh, Pa.

*Gibson, Will N., C. E.

Linn, Guy F., M. E., American Water Wks. and Guarantee Co., Pittsburgh, Pa.

McConnell, Malcolm F., M. E., Superintendent, Mingo Works, Carnegie Steel Co., Mingo Junction, Ohio.

Ramsey, Frank R., C. E., Asst. Engineer, Wabash Pittsburgh Terminal Ry. Co., 439 Wabash Bldg., Pittsburgh, Pa.

Sulzner, George T., Eng.

Wallace, Richard W., E. E., 1014 Evergreen Ave., Millvale, Pa.

Weldin, Wm. A., C. E., Designer, Pittsburgh-Buffalo Co., 408 Frick Bldg., Pittsburgh, Pa.

Wiley, James Garfield, C. E.

1903

Boothe, Willis, C. E., Murrayhill Ave., Pittsburgh, Pa.

Brown, Thomas H., C. E., Division Engineer, Baltimore & Ohio Southwestern, Flora, Ill.

Dodds, Samuel R., E. E., Electrical Engineer, Kilbourne and Clarke Mfg. Co., First Ave., Seattle, Washington.

Edwards, Edward T., M. E., Manager, Vanadium Alloys Steel Co., Latrobe, Pa.

Fitzharris, Frederick T., C. E., Engineer, Pittsburgh Terminal Railroad and Coal Co., Wabash Bldg., Pittsburgh, Pa.

Guenther, Emil B., M. E., Mechanical Engineer, Westinghouse Machine Co., East Pittsburgh, Pa.

Hogg, David M., M. E., Contractor, 804 Penn Ave., Pittsburgh, Pa.

Machesney, Harold C., Eng., Bridge Engineer, American Bridge Co., Ambridge, Pa.

McCutcheon, Norman D., C. E., Civil Engineer, National Fire Proofing Co., John Hancock Bldg., Boston, Mass.

Stein, Adam, Jr., E. E., Electrical Engineer, American Telephone & Telegraph Co., New York City.

Todd, George C., C. E., Beaver Falls, Pa.

Turner, George F., C. E., Civil Engineer, Smith & Turner, 410 Dollar Bank Bldg., Youngstown, Ohio.

Waggoner, Charles W., C. E., Structural Estimator, Pittsburgh Bridge & Iron Works, Rochester, Pa.

Wahr, Harry F., M. E., Asst. Sales Manager, Mesta Machine Co., Pittsburgh, Pa.

Warne, Charles C., M. E., Asst. Engineer, N. Y. C. & H. R. R., 81 East 125th St., New York City.

Worcester, Winthrop S., E. E., Farmer, Forest View Farm, Hallowell, Maine.

1904

Byers, Orah M., E. E., Electrical Engineer, American Window Glass Co., Jeannette, Pa.

Cooper, Walter S., C. E., Civil Engineer, Creston, Montana.

Craig, Paul S., C. E., Draftsman, Sacramento Valley Irrigation Co., Maxwell, California.

Crampton, B. P., E. E.

Dawson, Wm. E., C. E., U. S. Engineer Office, Keokuk, Iowa.

Dornbush, George A., C. E., Estimator (Structural Steel), Jones & Laughlin Steel Co., Pittsburgh, Pa.

Ellwood, Orville A., M. E., Erecting Engineer, Wm. B. Scaife & Sons Co., First Ave., Pittsburgh, Pa.

Ehrman, Sidney, C. E., Draftsman, American Bridge Co., Ambridge, Pa.

Filson, George C., C. E., Engineer in Charge, Pennsylvania Co., 1103 Union Station, Pittsburgh, Pa.

Gormley, Frank N., C. E., 112 Hemlock St., N. S., Pittsburgh, Pa.

Jones, Lester B., M. E., Automobile Tester, McAllister Bros. Motor Car Co., Baum and Beatty Sts., Pittsburgh, Pa.

Junkin, Hays MacLean, M. E., 704 Empire Bldg., Pittsburgh, Pa.

Libbey, James T., C. E., Contract Agent, Nelson-Merydith Co., 200 Lewis Block, Pittsburgh, Pa.

McHenry, Thomas, C. E., Civil Engineer, Pennsylvania Lines, 1007 Union Station, Pittsburgh, Pa.

McKirdy, Charles W., M. E., Chief Engineer, Louisiana Bridge Co., 1892 Napoleon Ave., New Orleans, Louisiana.

McKenna, Roy C., C. E., McKenna Bros. Brass Co., First Ave. and Ross St., Pittsburgh, Pa.

Page, Illted A., M. E., Checker, Des Moines Bridge and Iron Works, Curry Bldg., Pittsburgh, Pa.

Rosser, Chas. M., E. E., Contractor, Rosser & Maloney, Bellaire, Ohio.

Shanor, Edgar E., M. E., Chief Draftsman, Petroleum Iron Works, Sharon, Pa.

Taylor, Charles E., C. E., Civil and Mining Engineer, 7 Wood St., Pittsburgh, Pa.

Wagner, Gustave E. T., M. E., Chief Draftsman, Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Weeks, Alfred B., M. E.

1905

Crea, Thomas C., C. E., Supervisor of Tracks, Bessemer & Lake Erie R. R., Greenville, Pa.

Dambach, Wm. N., C. E., Civil Engineer, United States Engineer's Office, Wheeling, W. Va.

Davis, Roland R., E. E.

Duff, John Milton, M. E., Mechanical Engineer, American Steel & Wire Co., Pittsburgh, Pa.

Finley, William P., C. E., Craig, Colorado.

Henrici, Frederick Wm., C. E., Draftsman, American Bridge Co., Ambridge, Pa.

Jones, Archie R., C. E., Asst. Supervisor of Tracks, Eastern Division, N. Y. C. & H. R. R. Co., New York. Address—Jersey Shore, Pa., Vilas Station.

Knight, Walter S., M. E., 911 Evans Ave., McKeesport, Pa.

Kramer, Frank P., M. E., Riter-Conley Mfg. Co., Leetsdale, Pa.

Maxwell, Robert G., C. E., Draftsman, Fort Pitt Bridge Works, Canonsburg, Pa.

McFarland, James C., C. E., Civil Engineer, Buffalo & Lake Erie Traction Co., 202 State St., Erie, Pa.

McIntyre, John N., C. E., Engineer, American Steel & Wire Co., Pittsburgh, Pa.

Partington, Joshua A., M. E., Draftsman, Riter-Conley Mfg. Co., Leetsdale, Pa.

Rall, Robert O., M. E., Asst. Chief Draftsman, American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa.

Reineman, Walter G., C. E., Automobiles, Allegheny Auto Co., Ridge Ave., North Side, Pittsburgh, Pa.

Rogaliner, William L., M. E., Draftsman, Bureau of Construction, Pittsburgh, Pa.

Schaeffer, James G., M. E.

Stuebner, Ruben, C. E., Structural Draftsman, American Bridge Co., Chicago, Ill.

Willock, Sylvester R., M. E., Mechanical Engineer, Mesta Machine Co., Pittsburgh, Pa.

1906

Adams, Frank N., M. E., 1203 Resaca Place, N. S., Pittsburgh, Pa.

Bender, Allan P., E. E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Brunner, Elmer H., C. E., Engineer, G. & P. R. R. Co., Armstead, Montana.

Daugherty, R. L., E. E., Electrical Contractor, Center Ave. and Neville St., Pittsburgh, Pa.

Handleman, Morris, C. E.

Harlan, Clarence H., C. E., Structural Engineer, McClintic-Marshall Construction Co., Rankin, Pa.

Marsh, Howard G., M. E., Carnegie Steel Co., McCutcheon Mill, N. S., Pittsburgh, Pa.

Mitchell, Wayne S., E. E., Beaver, Pa.

Mulheim, Chas. B., M. E., Instructor in Mathematics, Rochester High School, Rochester, Pa.

McClelland, Robert T., C. E.

Price, Edward K., E. E., Advertising, G. P. Blackston, Arrott Bldg., Pittsburgh, Pa.

Reuter, Wm. C., M. E., Draftsman, American Bridge Co., Ambridge, Pa.

Schaefer, Ralph G., C. E., Civil Engineer, T. W. Phillips Gas and Oil Co., Butler, Pa.

Silliman, Guy F., C. E.

Taylor, Ernest S., C. E., 229 N. Craig St., Pittsburgh, Pa.

Truxal, Edward L., M. E., Chief Draftsman, American Steel & Wire Co., Braddock Plant, Braddock, Pa.

Weldin, Walter J., C. E., Clerk, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

Werner, Edward H., M. E., Designer and Checker, United Engineering and Foundry Co., Farmers Bank Bldg., Pittsburgh, Pa.

Whyte, Robert, M. E., Travelling Sales Engineer, Best Mfg. Co., Pittsburgh, Pa.

Wilson, Albert John E., Jr., C. E., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Wynne, Clarence B., Eng., American Bridge Co., Ambridge, Pa.

1907

Ambrose, Frederic B., E. E., Salesman, Westinghouse Electric & Mfg. Co., Union Bank Bldg., Pittsburgh, Pa.

Bole, Thomas M., C. E., Civil Engineer, Pennsylvania R. R., N. W. Division, 61st and Wentworth Sts., Chicago, Ill.

Carhart, Thomas C., C. E., Civil Engineer, Aluminum Co. of America, New Kensington, Pa.

Cooper, Wm. M., M. E., Draftsman, Pressed Steel Car Co., Pittsburgh, Pa.
Creelman, Leonadis J., C. E., Draftsman, American Bridge Co., Shiffler Plant, 48th St., Pittsburgh, Pa.
Dinger, Layard E., C. E.
Douglass, Thomas L., C. E., 410 Fifteenth St., New Brighton, Pa.
Elliott, Welday S., M. E., 1517 Tindal St., Pittsburgh, Pa.
Fisher, Wm. Clifford, C. E., Civil Engineer, Nampa, Idaho.
Glueck, Robert J., E. E., General Electric Company, Harrison, N. J.
Hartman, Charles M., M. E., Superintendent, Mechanical Dept., Ward Motor Vehicle Co., Concord Ave. and E. 143rd St., New York City
Horne, George H., E. E., Engineer, Nampa, Idaho.
Lambie, Joseph Sioussa, C. E., Instructor in Civil Engineering, University of Pittsburgh, Pittsburgh, Pa.
Mitchell, Lindsay LaC., E. E., Superintendent, Pittsburgh Transformer Co., North Side, Pittsburgh, Pa.
*Murray, William M., C. E.
Piper, Theodore J., C. E., Structural Draftsman, John Eichlay, Jr., Co., S. S., Pittsburgh, Pa.
Rose, Chester F., Eng., Signal Repairman, Pennsylvania Co., Lines West, Baden, Pa.
Schreiber, John W., M. E., Draftsman, Aluminum Co. of America, New Kensington, Pa.
Schweppe, Walter, M. E., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Stackhouse, Raymond C., E. E., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Terbush, Clifford E., C. E,, 38 Watsonia Blvd., N. S., Pittsburgh, Pa.
Thomson, Robert W., E. E., 413 Farmers Bank Bldg., Pittsburgh, Pa.
Van Blarcom, Conant, M. E.
Wetzel, Walter C., E. E., 1022 Canal St., Sharpsburg, Pa.

1908

Angle, Philip E., M. E., Carnegie Steel Co., Blast Furnace Dept., Duquesne, Pa.
Bates, H. H., C. E., Trunk Manufacturers, Grays Harbor Trunk Factory, 317 East Wishkah St., Aberdeen, Washington.
Boddie, Clarence A., E. E., Erecting Engineer, Westinghouse Electric & Mfg. Co., 730 Board of Trade Bldg., Boston, Mass.
Curry, Grant, M. E., LL.B., 603 Curry Bldg,. Pittsburgh, Pa.
Desch, John L., C. E., Morristown Traction Co., Morristown, N. J.
Edgar, Wm. C., C. E., Civil Engineer, Samuel E. Duff, Consulting Engineer, Empire Bldg., Pittsburgh, Pa.
*Eshelman, R. D., C. E.

Harley, John D., M. E., 2139 Rose St., Pittsburgh, Pa.
Inglefield, Chas. L., E. E., U. S. Government Inspector, U. S. Engineer Office, Georgetown, Pa.
Jamison, Richard H., C. E., 723 Whitney Ave., Wilkinsburg, Pa.
Kanhofer, Walter G., C. E., 405 Western Ave., Aspinwall, Pa.
Keenan, Albert W., C. E., Seventh and Poplar Sts., St. Louis, Mo.
Kissinger, George B., C. E., 317 Land Title Bldg., Philadelphia, Pa.
Magraw, Harry D., M. E., Mechanical Draftsman, National Tube Co., McKeesport, Pa.
Mohler, Ross Chester, M. E.
McKee, Edwin B., M. E., Mesta Machine Co., West Homestead, Pa.
Price, David R., E. E.
Routh, Charles M., M. E., Draftsman, Pressed Steel Car Co., 814 Wager St., Munhall, Pa.
Salkeld, Roy C., C. E., Civil Engineer, Pressed Steel Car Co., McKees Rocks, Pa.
Sherbon, George E., C. E., Civil Engineer, Monongahela Railroad Co., Brownsville, Pa.
Shriver, Karl H., C. E., Junior Engineer, U. S. Engineer Office, Farmers Bank Bldg., Pittsburgh, Pa.
Smith, Kosciusko McC., E. E.
Turner, Charles Alex, E. E., Electrical Engineer, The Pacific Telephone & Telegraph Co., 140 N. Montgomery St., San Francisco, Cal.
Vandivort, Samuel E., C. E., Inspector, Pittsburgh & Lake Erie R. R. Co., P. & L. E., Terminal Station, Pittsburgh, Pa.

1909

Boland, Jerome A., C. E., Civil Engineer, American Steel & Wire Co., Donora, Pa.
Cannon, Edgar C., C. E., U. S. Engineer Office, Farmers Bank Bldg., Pittsburgh, Pa.
Decker, James G., C. E., Columbia Concrete Steel Bar Co., Pittsburgh, Pa.
Farris, John, C. E., Contracting Engineer, Farris Bridge Co., Diamond Bank Bldg., Pittsburgh, Pa.
Long, Frederick A., C. E., 224 Meyran Ave., Pittsburgh, Pa.
Martin, James R. McI.. E. E., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
McCandless, Wm. J., C. E.
McElhinney, John H., M. E., Construction Supt., Federal Engineering Co., 1116 House Bldg., Pittsburgh, Pa.
McFeeters, Guy S., C. E., Civil Engineer, United States Government, 1812 Second Ave., Pittsburgh, Pa.
McGura, Jerome S., E. E.

McIntyre, Elmer L., C. E., Pittsburgh Bridge & Iron Works, Farmers Bank Bldg., Pittsburgh, Pa.

Neeld, Almos D., Jr., C. E., Construction Engineer, Richardson Construction Co., Inc., Fourth Ave., Pittsburgh, Pa.

Parr, William P., E. E.

Renton, Thomas E., Jr., M. E., Secretary and Asst. General Manager, Independent Rrfrigerating Co., Pittsburgh, Pa.

Renton, Walter C., M. E., Draftsman, Union Switch & Signal Co., Swissvale, Pa.

Risacher, Joseph L., M. E.

Roessing, Lawrence W., C. E., Civil Engineer, American Steel & Wire Co., Donora, Pa.

Rudolph, Clyde A., E. E.

Supplee, Charles W., C. E., Engineer, Riter-Conley Mfg. Co., Pittsburgh, Pa.

Thomas, Bennett T., C. E., Conemaugh Division, P. R. R., 1003 Penn Ave., Pittsburgh, Pa.

Wallace, Frederick J., E. E., Electrical Engineer, United States Government, Corozal, Panama.

Weber, John, Jr., M. E., Instructor in Mechanical Engineering, University of Pittsburgh, Pittsburgh, Pa.

Willock, Roy Leech, M. E., Designer and Estimator.

1910

Campbell, John T., C. E., American Water Works and Guarantee Co., Bank for Savings Bldg., Pittsburgh, Pa.

Crum, Frank M., C. E., Eng. Corps, C. & P. Division, Pennsylvania Co., 5713 Euclid Ave., Cleveland, Ohio.

Davis, Karl E., C. E., Associate Editor, Coal Trade Bulletin, 926 Park Bldg., Pittsburgh, Pa.

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Ferree, Eugene C., E. E., Electrical Engineer, National Tube Co., McKeesport, Pa.

Frazier, Albert S., C. E., 1935 Perrysville Ave., N. S., Pittsburgh, Pa.

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Kincaid, C. W., E. E., Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Millar, Wm. E., C. E., Inspector, American Bridge Co., Ambridge, Pa.

Mueller, Robert G., M. E., Automobile Business, Alco-Pittsburgh Sales Co., Ellsworth and College Aves., Pittsburgh, Pa.

Mueller, William F., Automobile Business, Alco-Pittsburgh Sales Co., Ellsworth and College Aves., Pittsburgh, Pa.

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Voelker, Aloys, C. E., 613 Chestnut St., N. S., Pittsburgh, Pa.

Wynne, Arthur V., Eng.,Trumbull Public Service Co., Warren, Ohio.

Young, Roy A., Eng., Draftsman, Pennsylvania Lines West of Pittsburgh, 1125 Union Station, Pittsburgh, Pa.

1911

Abel, Albert, E., M.E., Engineering Assistant, Hubbard Steel Foundry Company, 4344 Magoun Avenue, East Chicago, Indiana.

Conwell, Erle McK., E.E., Wire Chief, C. D. & P. Telegraph Company, Sharpsburg, Pa., 107 Richdale St., N. S., City.

Eades, H. S., M.E., Draftsman, American Bridge Company, Ambridge, Pa.

Farmer, Homer G., C.E., Testing Laboratories, Universal Portland Cement Company, 609 Sterrett Street, Pittsburgh, Pa.

Hague, Floyd T., C.E., Apprentice, Westinghouse Electric & Manufacturing Company, 7532 Hamilton Avenue, City.

Handmacher, Benjamin B., E.E., Equipment Staff, Western Union Telegraph Company, Pittsburgh, Pa.

Johnston, Arthur S., M.E., Special Apprentice, Westinghouse Air Brake Company, 709 Ninth Avenue, Beaver Falls, Pa.

Lowe, Harold Clifton, C.E., Assistant on Engineering Corps, Eastern Division of Pennsylvania Lines West of Pittsburgh, 825 Ridge Avenue, N. S., Pittsburgh, Pa.

Mesta, Lewis W., M.E., Mesta Machine Co., Box 1124, Pittsburgh, Pa.

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Moore, Jay R., E. E., Manager of Works Office, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Myler, Thomas K., C.E., Chairman, P. R. R., Trafford, Pa. Address 5512 Avondale Street, Pittsburgh, Pa.

McCutcheon, Kenneth D., C.E., National Fire Proofing Co., Boston, Mass., 31 Winchester St., Brookline, Mass.

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Reed, Charles S., E.E., Cadet Engineer, Doherty Operating Company, 60 Wall Street, New York City, N. Y.

Robbins, Samuel, C.E.

Robinson, Parker M., M.E., Fore River Shipbuilding Company, 16 S. Central Terrace, Wollaston, Mass.

Seanor, Francis W., M.E.

Shapiro, Harry, C.E., Draftsman, Tube Bending & Polishing Machine Company, Baltimore, Md., 4 S. Broadway, Baltimore, Md.
Simon, Richard J., E.E., Apprentice, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Address, 1906 Lowry Street, N. S., City.
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1912

Coyle, George Love, C.E., Civil Engineer, Tellico River Lumber Co., Tellico Plains, Tenn.
Ellis, Lester D., M.E., Machinist, Experimental Department, 1535 Spring Garden Street, Philadelphia, Pa.
Everhart, Samuel Dunlap, Jr., M.E., Pittsburgh Valve Foundry & Machine Co., Pittsburgh, Pa.
Hallock, John Wilson Wishart, M. E., Sales Department, Harris Pump & Supply Company, 309 Elysian Ave., E.E., Pittsburgh, Pa.
Kammer, Glenn Donald.
Mannion, Michael Francis, Monongahela Division, Pennsylvania Lines.
Mueller, Richard William, M.E.
Muntz, Richard, E.E., Lineman's Helper, Pittsburgh Crucible Steel Company, Midland Works, Midland, Pa. Address, 234 Insurance Street, Beaver, Pa.
McCluskey, William Oliver, Jr., C.E., Assistant Engineer, Foundation Company of New York, Wheeling, W. Va.
McDaniel, William Lyle, Jr., C.E., Instrumentman, Chief Engineer's Office, P. C. C. & St. L. Ry., Pittsburgh, Pa. Address, 1105 Walnut Street, Wilkinsburg, Pa.
McIntyre, Lewis Wedsel, C.E., Assistant Engineer, Bureau of Construction. Address, 3317 Ridgeway Street, Pittsburgh, Pa.
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Smith, Ralph Harold, C.E., Penna. Lines West of Pittsburgh, Pittsburgh, Pa.
Stern, Walter R., C.E., Estimator, Best Manufacturing Company. Address, 206 Chester Avenue, N. S., Pittsburgh, Pa.
Wilcox, Homer G., C.E., American Sheet & Tin Plate Company, draftsman, 1220 Frick Building. Address, 7148 Upland Street, Pittsburgh, Pa.

ENGINEERING ALUMNI

UNIVERSITY OF PITTSBURGH

Name	Degree	Class
Abel, Albert E.	M.E.	1911
Adams, Frank N.	M.E.	1906
Affelder, Louis J.	C.E.	1894
Ambrose, Frederic B.	E.E.	1907
Angle, Philip E.	M.E.	1908
Barbour, George H.	C.E.	1887
Barr, J. Toner	Eng.	1901
Barrett, John H.	C.E.	1889
Bates, H. H.	C.E.	1908
Bauer, George F	C.E.	1900
*Beckert, Jacob C.	M.E.	1896
Bender, Allan P.	E.E.	1906
Benner, Jacob W.	M.E.	1901
Bennett, Edward	E.E.	1897
Biggert, Florence C.	M.E.	1899
Biggs, George W., Jr.	C.E.	1897
Blackadore, John	C.E.	1900
Boddie, Clarence A.	E.E.	1908
Boland, Jerome A.	C.E.	1909
Bole, Thomas M.	C.E.	1907
Boothe, Willis	C.E.	1903
Boyd, Thomas W.	Eng.	1896
Bradshaw, William M.	E.E.	1897
Bratt, Berton	M.E.	1893
*Bray, Harry E.	C.E.	1885
Bright, Frederick W.	C.E.	1888
Bright, Graham	E.E.	1897
*Bright, Paul	C.E	1893
Brinker, Wm. E.	Eng.	1902
Brown, Robert C.	C.E.	1894
Brown, Thomas H.	C.E.	1903
Brunner, Elmer H.	C.E.	1906
Buene, Charles F.	C.E.	1885
Butz, Harry A.	E.E.	1898
Byers, Orah M.	E.E.	1904
Calvert, George H.	C.E.	1893
Camp, James McIntyre	C.E.	1880
Campbell, John T.	C.E.	1910
Canfield, Maurice P.	C.E.	1876
Cannon, Edgar C.	C.E.	1909
Carey, Joseph F.	C.E.	1885
Carhart, Thomas C.	C.E.	1907
Chalfant, Frederick B.	C.E.	1902
Clark, Milnor P.	E.E.	1894
Coates, Edward S.	E.E.	1900
Cochran, Charles E.	C.E.	1898
Coffin, William C	C.E.	1883
Collins, Frank S.	M.E.	1900
Collins, Palmer	M.E.	1899
Conwell, Erle McK.	E.E.	1911
Cooper, Frederick M.	C.E.	1892
Cooper, Walter S.	C.E.	1904
Cooper, William M.	M.E.	1907
Coyle, George Love	C.E.	1912
Craig, Paul S.	C.E.	1904
Crampton, B. P.	E.E.	1904
Crea, Thomas C.	C.E.	1905
Creelman, Leonidas J	C.E.	1907
Crider, James L.	C.E.	1888
Crum, Frank M.	C.E.	1910
Cullers, William H.	C.E.	1901
Curry, Grant	M.E.	1908
Dambach, Wm. N.	C.E.	1905
Dammond, Wm. Hunter,	C.E.	1894
Daugherty, Rush L.	E.E.	1906
Davis, Alfred C.	E.E.	1897
Davis, Charles W.	M.E.	1892
Davis, Karl E.	C.E.	1910
Davis, Roland R.	E.E.	1905
Dawson, Wm. E.	C.E.	1904
Decker, James C.	C.E.	1909
Desch, John L.	C.E.	1908
DesIslets, John C.	Eng.	1901
DeVore, Henry C.	M.E.	1898
Dickey, Alfred C.	C.E.	1895
Dietz, Louis A.	C.E.	1896
Dinger, Layard E.	C.E.	1907
Dodds, Samuel R.	E.E.	1903
Donaldson, Joseph T.	C.E.	1892
Dornbush, Charles C.	C.E.	1897
Dornbush, George A.	C.E.	1904
Dougherty, Lemuel H.	C.E.	1902
Douglass, Robert McC	Eng.	1894
Douglass, Thomas L.	C.E.	1907
Douthitt, Philip	C.E.	1893
Drexler, Louis A.	Eng.	1898
DuBarry, Dudley D.	Eng.	1895
DuBarry, Harry F.	Eng.	1895
Duff, John M.	M.E.	1905
Dunlap, John H.	Eng.	1894
Dunnells, Clifford G.	Eng.	1896
Dygert, Warren B.	C.E.	1910
Eades, Herbert S.	M.E.	1911
Earl, Howard A.	C.E.	1901
Edgar, William C.	C.E.	1908
Edwards, Edward T.	M.E.	1903

Name	Degree	Class
Ehlers, Charles W.	C.E.	1890
Ehrman, Sidney	C.E.	1904
Eisenbeis, Walter H.	E.E.	1902
Elliott, James R.	C.E.	1893
Elliott, Welday S.	M.E	1907
Ellis, Lester D.	M.E.	1912
Ellwood, Orville A.	M.E.	1904
Elverson, Howard W	Eng.	1896
Emmons, Charles DeM.,	C.E.	1892
*Eshelman, R. D.	C.E.	1908
Everhart, Samuel D., Jr.	M.E.	1912
Farmer, Homer G.	C.E.	1911
Farmer, James McD.	Eng.	1902
Farrar, Silas C.	M.E.	1896
Farris, John	C.E.	1909
Fawcett, Lewis P	Eng.	1895
Ferree, Eugene C.	E.E.	1910
Filson, George C.	C.E.	1904
Finley, William P.	C.E.	1905
Fisher, Wm. Clifford	C.E.	1907
Fisher, Chester G.	M.E.	1900
Fitzharris, Frederick T.	C.E.	1903
*Flack, Charles A.	C.E.	1893
Francies, Edward S.	C.E.	1897
Francies, Wm. H.	C.E.	1896
Frazier, Albert	C.E.	1910
Fullerton, Hugh L.	E.E.	1902
Ganter, Carl F.	Eng.	1904
Gerber, Christian G.	C.E.	1900
Gerwig, Frederick H. N.,	M.E.	1895
*Gibson, Wm. N.	C.E.	1902
Gilfillan, George A.	C.E.	1888
Glaubitz, Hugo	C.E.	1896
Glueck, Robert J.	E.E.	1907
Godfrey, Edward	C.E.	1893
Goehring, Charles P.	C.E.	1900
Goldie, William, Jr.	M.E.	1898
Gormley, Frank N.	C.E.	1904
Gray, Arthur E.	M.E.	1899
Gray, Guy McC.	C.E.	1894
Gray, James C.	C.E.	1884
Guenther, Emil B.	M.E.	1903
Hague, Floyd T.	E.E.	1911
Hallock, John W. W.	M.E.	1912
Hamilton, Alfred R.	Eng.	1894
Hammer, Howard G.	Eng.	1900
Handleman, Morris	C.E.	1906
Handmacher, Benj. B.	E.E.	1911
Hanna, Roscoe E.	Eng.	1899
Hansen, William K. W.,	M.E.	1901
Harlan, Clarence H.	C.E.	1906

Name	Degree	Class
Harley, John D.	M.E.	1908
Harlow, James H., Jr.	C.E.	1896
Harrer, Henry	E.E.	1895
Hartman, Charles M.	M.E.	1907
*Hartupee, Wm. Dilw.	M.E.	1873
Hay, Paul Liscomb	M.E.	1895
Hays, James W.	C.E.	1891
Haynes, Harold A.	E.E.	1910
Henrici, Frederick Wm.,	C.E.	1905
Herr, Andrew G.	Eng.	1901
*Herron, George K.	C.E.	1890
Hillman, John J., Jr.	Eng.	1901
Hindman, William S.	C.E.	1898
Hockensmith ,Wilbur D.,	M.E.	1901
Hoerr, Alexander L.	M.E.	1895
Hoffman, John W.	Eng.	1902
Hogg, David M.	M.E.	1903
Hoopes, Henry T.	E.E.	1897
Horne, George H.	E.E.	1907
Horner, Joseph T.	E.E.	1896
House, Edward B.	Eng.	1896
Howatt, John B.	Eng.	1893
Hunter, Harry M. L.	M.E.	1896
Hunter, Percy E.	M.E.	1895
Hunter, Samuel K.	C.E.	1900
Hurst, Oliver C.	M.E.	1898
Inglefield, Charles L.	E.E.	1908
Irwin, Lee S.	Eng.	1899
Isenthal, Leo Ralph	C.E.	1892
Jack, Wilbur Lee	Eng.	1896
Jamison, Richard H.	C.E.	1908
Jenkins, Jenks C.	C.E.	1888
Johnson, Frank F.	Eng.	1901
Johnston, Arthur S.	M.E.	1911
Johnston, Edward VanD.	M.E.	1897
Johnston, John P	C.E.	1890
Jones, Archibald R.	C.E.	1905
Jones, Lester B.	M.E.	1904
Junkin, Hays MacLean	M.E.	1904
Kammer, Glenn Donald	—	1912
Kanhofer, Walter G.	C.E.	1908
Kehew, Everette E.	Eng.	1894
Keller, Charles	C.E.	1879
Kelly, Henry E.	E.E.	1898
Keenan, Albert W.	C.E.	1908
Kier, Samuel M.	E.E.	1897
Kincaid, Charles W.	E.E.	1910
Kirker, Albert H.	M.E.	1895
Kiser, Alexander B.	E.E.	1897
Kissinger, George B.	C.E.	1908
Knight, Walter S.	M.E.	1905

Name	Degree	Class
Knopf, Julius R.	M.E.	1901
Knotts, William W.	M.E.	1910
Kramer, Frank P.	M.E.	1905
Kunkle, Charles E.	C.E.	1892
Lambie, Charles S.	C.E.	1900
Lambie, Joseph S.	C.E.	1907
Langenheim, Gustave G.,	C.E.	1890
Lauman, Walter H.	C.E.	1893
Layng, Frank R.	Eng.	1900
Libbey, James T.	C.E.	1904
Liggett, Dudley S.	C.E.	1891
Liggett, Sidney S.	Eng.	1897
Linn, Guy F.	M.E.	1902
Long, Frederick A.	C.E.	1909
Lowe, Harold C.	C.E.	1911
Lyons, James K.	C.E.	1887
Macfarren, Walter W.	M.E.	1895
Machesney, Harold B.	Eng.	1903
Magaw, Harry D.	M.E.	1908
Mannion, Mich. Francis	—	1912
Marsh, Howard G.	M.E.	1906
*Marshall, Thomas F.	C.E.	1858
Martin, James R. McI.	E.E.	1909
Maxwell, Robert G.	C.E.	1905
Mesta, George	C.E.	1885
Mesta, Lewis W.	M.E.	1911
Miles, J. Walter	C.E.	1892
Millar, William E.	C.E.	1910
Miller, Frank F.	M.E.	1901
Miller, John A. W.	M.E.	1901
Miller, John Hays	C.E.	1911
*Miller, Ralph W.	C.E.	1899
Mitchell, Lindsay LaC.	E.E.	1907
Mitchell, William H.	M.E.	1901
Mitchell, Wayne S.	E.E.	1906
Mohler, Ross Chester	M.E.	1908
Mollenhauer, Fred'k H.	C.E.	1891
Moody, Wm. Falley	Eng.	1901
Moon, Charles S.	Eng.	1895
Moore, Jay R.	E.E.	1911
Morganstern, Ralph M.,	E.E.	1897
*Morley, Isaac	C.E.	1846
Mould, Edmund F.	Eng.	1899
Mueller, Richard Wm.	M.E.	1912
Mueller, Robert G.	M.E.	1910
Mueller, William F.	M.E.	1910
Mulheim, Charles B.	M.E.	1906
Munroe, Charles L.	Eng.	1900
Muntz, Richard	E.E.	1912
Murdock, William H.	Eng.	1901
Murray, William M.	C.E.	1907

Name	Degree	Class
Murry, John S.	C.E.	1899
Myler, Thomas K.	C.E.	1911
McCabe, Junius D.	C.E.	1884
McCabe, William P.	C.E.	1891
McCandless, William J.	C.E.	1909
McConnell, Malcom F.	M.E.	1902
McClelland, Robert T.	C.E.	1906
McCluskey, Wm. O., Jr.	C.E.	1912
McCormick, Roscoe T.	C.E.	1888
McCullough, Harvey V.,	C.E.	1896
McCullough, Ross	C.E.	1876
McCutcheon, Kenneth D.,	C.E.	1911
McCutcheon, Norman D.,	C.E.	1903
McDaniel, Wm. Lyle, Jr.,	C.E.	1912
McElhinney, John H.	M.E.	1909
McEwen, John A.	M.E.	1894
McFarland, James C.	C.E.	1905
McFeeters, Guy S.	C.E.	1909
McGrew, Anson B.	C.E.	1892
McGrew, John	C.E.	1891
McGurn, Jerome S.	E.E.	1909
McHenry, Thomas	C.E.	1904
McIntyre, Lewis Wedsel,	C.E.	1912
McIntyre, Elmer L.	C.E.	1909
McIntyre, John N.	C.E.	1905
McKee, Edwin B.	M.E.	1908
McKee, D. Gregg	E.E.	1895
McKean, Robert A.	C.E.	1886
McKenna, Roy C.	E.E.	1904
McKirdy, Charles W.	M.E.	1904
McMaster, Robert T.	C.E.	1896
Nagle, James C.	C.E.	1892
Neeld, Almos D.	C.E.	1875
Neeld, Almos D., Jr.	C.E.	1909
Neeld, Charles M.	C.E.	1896
Neeld, Robert E.	C.E.	1910
Neely, William R.	M.E.	1896
Neubert, Walter P.	E.E.	1894
Nevin, William C.	Eng.	1895
Nicholson, John H.	Eng.	1887
Noble, Howard A.	Eng.	1896
O'Hagan, Charles F.	C.E.	1900
Oleson, Walter E.	E.E.	1911
Orr, Almer H.	Eng.	1900
Page, Illtcd A.	M.E.	1904
Palmer, George B.	Eng.	1899
Parkinson, David I.	E.E.	1894
Parr, William P.	E.E.	1909
Partington, Joshua A.	M.E.	1905

Name	Degree	Class
Patterson, Peter C.	Eng.	1896
Paul, Earl W.	E.E.	1901
Pennington, Harley	M.E.	1899
Peterson, Albert A.	Eng.	1899
Plecker, May Burt	C.E.	1897
Piper, Theodore J.	C.E.	1907
Porter, James C.	Eng.	1896
Price, Edward K.	E.E.	1906
Price, David R.	E.E.	1908
*Price, Jesse B	C.E.	1894
*Price, Philip W.	C.E.	1899
*Purdy, William G.	C.E.	1892
Rall, Robert O.	M.E.	1905
Ramsey, Frank R.	C.E.	1902
Rankin, Harry H.	C.E.	1897
Ransom, George W.	E.E.	1901
Reed, Charles S.	E.E.	1911
Reed, James	C.E.	1870
Reid, Samuel	C.E.	1899
Reineman, Walter G.	C.E.	1905
Reizenstein, Harry S.	E.E.	1910
Renton, Thomas E., Jr.,	M.E.	1909
Renton, Walter C.	M.E.	1909
Reuter, William C.	M.E.	1906
Rhea, Frank C.	C.E.	1892
Richards, Harold E.	M.E.	1912
Richards, Robert W.	M.E.	1910
Richardson, Jos. Geo.	C.E.	1912
Ritchey, Charles W.	C.E.	1895
Ridinger, Charles W.	E.E.	1893
Riley, Albert D.	M.E.	1898
Risacher, Joseph L.	M.E.	1909
Robbins, Samuel	C.E.	1911
Roberts, Elijah R.	E.E.	1899
Roberts, James M.	C.E.	1910
Robinson, Parker M.	M.E.	1911
Roessing, Frank M.	E.E.	1900
Roessing, Lawrence W.	C.E.	1909
*Rogaliner, Morris L.	C.E.	1899
Rogaliner, Wm. L.	M.E.	1905
Rose, Chester F	Eng.	1907
Rose, George R.	C.E.	1892
Rosewell, Joseph T.	C.E.	1886
Rosser, Charles M.	E.E.	1904
Routh, Charles M.	M.E.	1908
Rudolph, Clyde A.	E.E.	1909
Russell, John W.	E.E.	1899
Rust, Frank, Jr.	Eng.	1896
Salkeld, Roy C.	C.E.	1908
Sapp, Edward H.	C.E.	1893
Schaeffer, James G.	M.E.	1905
Schaefer, Ralph G.	C.E.	1906

Name	Degree	Class
Schreiber, John W.	M.E.	1907
Schweppe, Walter	M.E.	1907
Scott, Walter C.	Eng.	1893
Seanor, Francis W.	M.E.	1911
Shaler, Edward C.	C.E.	1893
Shanor, Edgar E.	M.E.	1904
Shapiro, Harry	C.E.	1911
Sherbon, George E.	C.E.	1908
Shriver, Karl H.	C.E.	1908
Shrom, William G.	M.E.	1897
Sickman, Albert F.	C.E.	1878
Silliman, Guy F.	C.E.	1906
Simon, Richard	E.E.	1911
Singer, Edgar H.	C.E.	1911
Slaymaker, Philip K.	M.E.	1898
*Smith, John F.	C.E.	1892
Smith, J. Hammond	E.E.	1898
Smith, Kosciusko McC.,	E.E.	1908
Smith, Ralph Harold	C.E.	1912
Smith, Richard L.	C.E.	1888
Smith, Wm. A.	C.E.	1900
Smith, William R.	Eng.	1874
Spencer, Stewart C.	Eng.	1896
Sperling, George E.	C.E.	1898
Stackhouse, Raymond C.,	E.E.	1907
Steel, Gardner	Eng.	1895
Stern, Walter R.	C.E.	1912
Stein, Adam, Jr.	E.E.	1903
Stewart, Charles A.	Eng.	1874
Stewart, Reid T.	C.E.	1885
*Stilley, Edward J.	C.E.	1846
Stoner, Frank R.	Eng.	1887
Strassburger, Daniel S.,	C.E.	1896
Stuebner, Ruben	C.E.	1905
Sulzner, George T.	Eng.	1902
Supplee, Charles W.	C.E.	1909
Swan, John, Jr.	Eng.	1893
Swan, Robert	C.E.	1879
Tanner, J. Roy	Eng.	1896
Taylor, Allen R.	C.E.	1910
Taylor, Charles E.	C.E.	1904
Taylor, Ernest S.	C.E.	1906
Taylor, John L.	C.E.	1898
Taylor, Samuel A.	C.E.	1887
Terbush, Clifford C.	C.E.	1907
Thomas, Bennett T.	C.E.	1909
Thomas, Edwin L.	Eng.	1899
Thomson, Robert W.	E.E.	1907
Todd, George C.	C.E.	1903
Trees, Joseph Clifton	C.E.	1895
Trimble, Alexander F.	C.E.	1897
Trimble, Robert	Eng.	1875
Truxall, Edward L.	M.E.	1906

Name	Degree	Class
Turner, Charles A.	E.E.	1908
Turner, George F.	C.E.	1903
Turner, Howard Q.	Eng.	1893
Van Blarcom, Conant	M.E.	1907
Vandivort, Samuel E.	C.E.	1908
Voelker, Aloys	C.E.	1910
Waggoner, Charles W.	C.E.	1903
Wagner, Gustave E. T.	M.E.	1904
Wahr, Harry F.	M.E.	1903
Wallace, Frederick J.	M.E.	1909
Wallace, Richard W.	E.E.	1902
Ward, Charles A.	M.E.	1900
Warne, Charles C.	M.E.	1903
Watt, Herman E.	M.E.	1901
Weber, John, Jr.	M.E.	1909
Weeks, Alfred B.	M.E.	1904
Weldin, William A.	C.E.	1902
Weldin, Walter J.	C.E.	1906

Name	Degree	Class
Werner, Edward H.	M.E.	1906
Wetzel, Walter C.	E.E.	1907
Whyte, Robert	M.E.	1906
Wilcox, Homer G.	C.E.	1912
Wilde, Herbert K.	C.E.	1897
Wiley, James G.	C.E.	1902
Willock, Roy Leech	M.E.	1909
Willock, Sylvester R.	M.E.	1905
Wilson, Albert J. E., Jr.,	C.E.	1906
Wilson, Henry M.	M.E.	1895
Wittmer, George, Jr.	M.E.	1892
Wittmer, Thomas	Eng.	1896
Woodson, Howard D.	C.E.	1899
Woolridge, Charles L.	Eng.	1897
Worcester, Winthrop S.,	E.E.	1903
Wuth, Wm. B.	Eng.	1899
Wylie, Thomas B.	Eng.	1893
Wynne, Arthur V.	Eng.	1910
Wynne, Clarence B.	Eng.	1906
Young, Roy A.	Eng.	1910

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1914/15

VOL. 10 APRIL 25, 1914 No. 12

University of Pittsburgh
Bulletin

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ANNOUNCEMENT SERIES

The School of Engineering

ANNOUNCEMENT FOR
1914-1915
and
ALUMNI REGISTER

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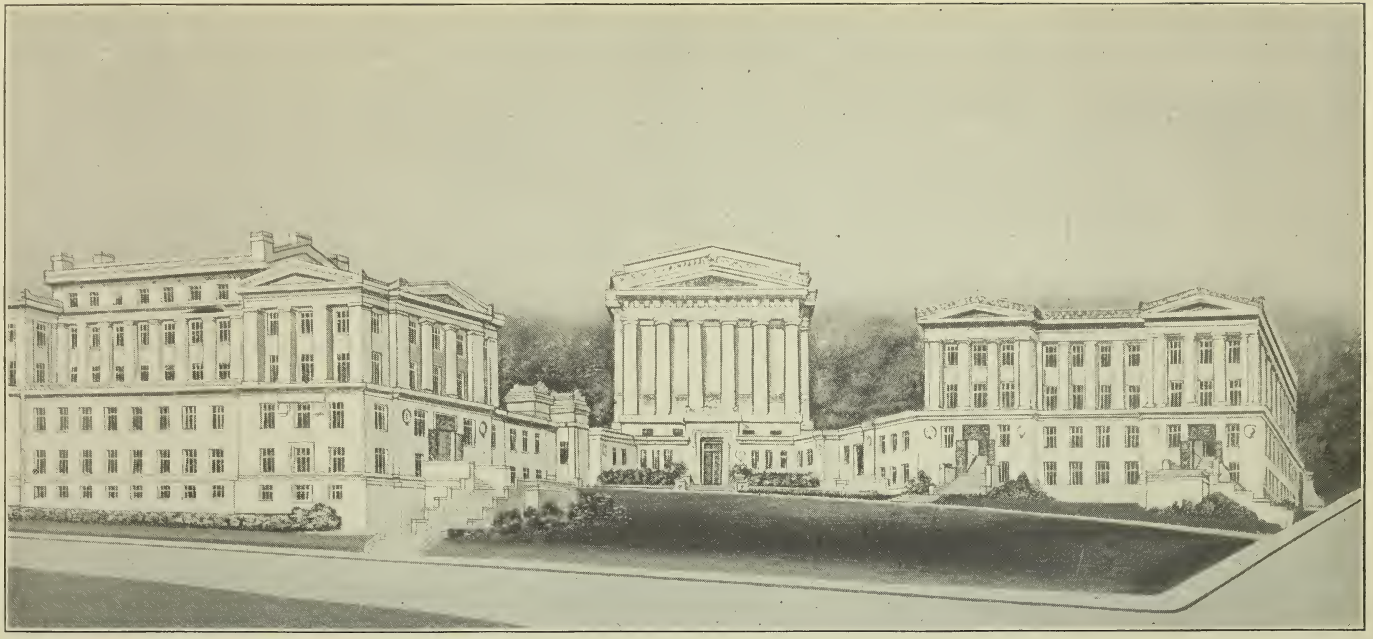
1908



Thaw Hall School of Engineering Proposed Administration Building State Hall School of Mines

VOL. 10 APRIL 25, 1914 No. 12

University of Pittsburgh Bulletin

ANNOUNCEMENT SERIES

The School of Engineering

ANNOUNCEMENT FOR
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and
ALUMNI REGISTER

1908

1914-1915

June 22	Monday—Summer Term of ten weeks begins. (Engineering and Mines.)
August 28	Saturday—Summer Term ends.
September 21-26	Monday to Saturday inclusive—Registration week.
September 28	Monday—Work begins in all Schools.
November 26-28	**Thursday to Saturday—Thanksgiving recess, all Schools.**
November 27, 28	Friday and Saturday—Educational Conferences under the Auspices of The University.
December 19	Saturday—Fall Term closes.
December 21	Monday—Vacation of two weeks begins.

1915

January 4	Monday—Winter Term of eleven weeks begins.
February 22	Monday—Washington's Birthday, Holiday.
February 28	Sunday—Charter Day.
March 20	Saturday—Winter Term ends.
March 22	Monday—Spring Vacation begins.
March 29	Monday—Spring Term of Eleven weeks begins.
April 2	Friday—Good Friday. Holiday.
May 30	Sunday—Decoration Day.
June 12	Saturday—Spring Term ends.
June 13	Sunday—Baccalaureate Sermon.
June 14-19	Monday—Saturday inclusive—Examinations for admission. (College Entrance Examination Board.)
June 16	Wednesday, Commencement, all Schools.
June 21	Monday—Summer Term begins.
August 28	Saturday—Summer Term ends.

OFFICES AND OFFICE HOURS

Office, Thaw Hall, Grant Boulevard—Consultation Hours: 8:30 A. M. to 5:30 P. M.

General Office, State Hall; Telephone Schenley 3300.

For catalogues and other information, address the Secretary of the University, Grant Boulevard.

Dean Bishop, 101 Thaw.
Professor Phillips, 303 Thaw.
Professor Stewart, 109 Thaw.
Professor Smith, 202 Thaw.
Professor Lincoln, 207 Thaw.
Professor Knowles, 406 Thaw.
Associate Prof. Harris, 207 Thaw.
Asst. Prof. Case, 406 Thaw.
Asst. Prof. Ritter, 109 Thaw.
Mr. Dyche, 207 Thaw.
Mr. McCandliss, 202 Thaw.
Asst. Prof. Lambie, 406 Thaw.
Asst. Prof. Weber, 7 Thaw.

The Dean's Office, 101 Thaw Hall, School of Engineering is open from 8:30 A. M. to 5:30 P. M. Telephone 3300 Schenley.

FACULTY.

Samuel Black McCormick, D.D., LL.D., Chancellor.

S. B. Linhart, A.M., D.D., Secretary of the University.

Albert Ellis Frost, A.M., Sc.D., University Registrar.

Frederic Lendall Bishop, Ph.D., Dean, Professor of Physics.

Daniel Carhart, M.C.E., Sc.D., Emeritus Professor of Civil Engineering.

Francis Clifford Phillips, Ph.D., Professor of Chemistry.

Reid Thomas Stewart, Ph.M., C.E., Professor and Head of Department of Mechanical Engineering.

John Hammond Smith, E.E., Professor, and Head of the Department of Civil Engineering.

Paul Martyn Lincoln, M.E. in E.E., Professor, and Head of Department of Electrical Engineering.

Morris Knowles, B.S., C.E., Director, Department of Sanitary Engineering.

Benjamin Talbot Brooks, Ph.D., Professor, and Head of Department of Chemical Engineering.

David Francis Crawford, Director, Department of Mechanical Railway Engineering.

Louis Eugene Endsley, M.E., Professor of Mechanical Railway Engineering.

Leslie Huntington Harris, B.S. in E.E., Associate Professor of Electrical Engineering.

Alexander Ritter, M.E., Assistant Professor of Mechanical Engineering.

John Weber, M.E., Assistant Professor of Mechanical Engineering.

Joseph Sioussa Lambie, C.E., Assistant Professor of Civil Engineering.

George Wilkinson Case, M.C.E., Assistant Professor of Sanitary Engineering.

Howard Edward Dyche, M.E. in E.E., Instructor, in Electrical Engineering.

Lester Chipman McCandliss, B.S. in C.E., Instructor in Civil Engineering.

George Harry Swerger, Assistant in Elementary Mechanical Laboratory.

Charles George Kreiner, Assistant in Elementary Mechanical Laboratory.

Albert H. Kotsch, Mechanician in Electrical and Physics Laboratory.

Edward Alfred Klages, Mechanician in Mechanical Laboratory.

Joe Wallace, Assistant in Mechanics Laboratory.

Christian Howard Kast, Secretary to the Dean.

MEMBER OF THE FACULTY and Teaching Staff of Other Schools Giving Instruction in the School of Engineering.

JOHN COLVIN FETTERMAN, PH.M., Dean of the College, Professor of Biology.

JOHN THOM HOLDSWORTH, PH.D., Dean of the School of Economics, Professor of Finance and Economics.

FERDINAND BERGER, A.M., Professor of the German Language and Literature.

ALEXANDER SILVERMAN, M.S., Professor of Analytical Chemistry.

LINCOLN ROBINSON GIBBS, A.M., Professor of English and English Literature.

CALVIN NATZINGER WENRICH, PH.D., Professor of Physics.

FRANCIS JEROME HOLDER, PH.D., Professor of Mathematics.

ANDREW BENNETT WALLGREN, M.D., Assistant Professor of Zoology.

PHILIP WARNER HARRY, PH.D., Assistant Professor of the Romance Language.

CLARENCE CHARLES VOGT, PH.D., Assistant Professor of Inorganic and Physical Chemistry.

HENRY LEIGHTON, A.B., Assistant Professor of Economic Geology.

IRA GRAESSLE FLOCKEN, Assistant Professor of Industry and Accounting.

ROSWELL HILL JOHNSON, B.S., Assistant Professor in Biology and Geology.

ORRIN WILSON ALBERT, A.M., Instructor in Mathematics.

ISAAC BOYCE, D.D., Instructor in Spanish.

LAWRENCE WYLIE BURDICK, PH.D., Instructor in Latin and German.

JOHN KEMERER MILLER, A.B., Instructor in English.

AARON MOYER SNYDER, PH.D., Instructor in Psychology.

CHARLES SHIVELY MILLER, Physical Director and Director of Athletics.

FOREST ALMOS FORAKER, M.S., Instructor in Mathematics.

FLEMING ALLEN CLAY PERRIN, A.B., Instructor in Philosophy and Psychology.

AVV EMILIO PIERUCCI, LL.D., Instructor in Italian.

WHITFORD HUSTON SHELTON, A.M., Instructor in Romance Languages.

LOUIS FRANKLIN SNOW, PH.D., Instructor in English.

DAYTON ULREY, A.M., Instructor in Physics.

W. PAUL WEBBER, PH.D., Instructor in Mathematics.

ALGERNON ASHBURNER OSBORNE, A.B., Instructor in Commerce and Industry.

MARKS NEIDLE, PH.D., Instructor in Analytical and Physical Chemistry.

CO-OPERATIVE PLAN OF ENGINEERING INSTRUCTION

The work in the School of Engineering is carried on under the co-operative plan. This means that the student, during his course, works four terms of three months each in some of the engineering industries of the Pittsburgh district, and receives the same amount of theoretical training as he would in any engineering school, in addition.

The work is conducted under actual commercial conditions. Thoroughly practical knowledge can be had only by actual work in the engineering industries and should be required as early as possible. Working side by side with other employees, students get an insight into labor conditions. Detailed observation of engineering work and the conduct of business, from the productive point of view, gained in the student's formative years, is an invaluable addition to the knowledge gained from text-books and instructors.

Although the University has made special arrangements with local industrial concerns and will co-operate with these concerns, in all possible ways, for the benefit of its engineering students, students are regarded as direct employees of the concerns. They serve for six working days each week, receive pay, are required to observe the regulations of the company, and are subject to existing labor conditions and laws, including those pertaining to liability for accident.

This industrial practice is arranged, so far as feasible, to provide every student with an opportunity of working in the branch of engineering in which he is especially interested. It is also arranged that a part of the class shall be in school and a part in practical work at the same time, interchanging in such a manner that continuous service is furnished to the manufacturer.

Each student reports to the proper instructor one evening of each alternate week, for a discussion of his practical work; at the end of the term, on presentation of a written report of his work and observations, he receives twenty credits.

FIRMS WITH WHOM THE STUDENTS DO CO-OPERATIVE WORK

City of Pittsburgh, Department of Public Health.
Duquesne Steel Foundry.
Duquesne Steel Works.
Douglass & McKnight, Civil Engineers.
John F. Casey Contracting Co.
Farris Bridge Co.
Hope Engineering and Supply Co.
Lewis Foundry Machine Co.
Mesta-Machine Co.
McClintic-Marshall Construction Co.
National Tube Company.
Pennsylvania Company.

Pittsburgh Steel Co.
Pittsburgh Transformer Co.
Pennsylvania State Department of Health.
Oliver Power Plant.
H. K. Porter Co.
Riter-Conley Mfg. Co.
Pressed Steel Car Co.
Union Switch & Signal Co.
United States Engineers Office.
Westinghouse Electric & Mfg. Co.
Westinghouse Machine Company.
Carnegie Institute and Library.

VISITS OF INSPECTION

To take advantage of the opportunities offered by the Pittsburgh district, in every way possible, there has been organized a series of visits of inspection to the different manufacturing plants. These begin in the Freshman year when the visits are made in connection with Chemistry and Elementary Mechanical Laboratory, and extend throughout the entire course. During the Junior and Senior years, they are made in connection with the special work of the different departments.

Visits of inspection are preceded by a half-hour descriptive lecture by the instructor. Reports are required from each student on each visit. The following is a partial list of the plants and engineering work visited during the year 1912-1913:

American Bridge Company.
Brunot's Island Power Plant.
Beaver Bridge.
Carnegie Steel Company, Homestead Works.
Cambria Steel Company, Johnstown, Pa.
County Work House, Sewage Disposal Plant, Claremont, Pa.
Duquesne Steel Works, Duquesne, Pa.
Electrically Operated Coal Mines.
Fort Pitt Bridge Works.
H. J. Heinz Plant and Bottle Works.
Hamilton Glass Works, Pittsburgh, Pa.
Hubbard & Co., Manufacturers, Pittsburgh, Pa.
Jones & Laughlin Steel Company.
Mesta Machine Company.
McClintic-Marshall Construction Company.
National Tube Company.
Oil Well Supply Company, Pittsburgh, Pa.
Pennsylvania Railroad Test Plant, Altoona, Pa.
Pittsburgh Provision & Packing Co.
Pittsburgh Railway Company Power Plants.

Pressed Steel Car Company.
Pittsburgh and Lake Erie Repair Shop.
Pittsburgh Water Filtration Plant.
Pennsylvania Water Company, Filtration Plant.
Phipps Power Plant.
Riter-Conley Manufacturing Company.
Sewickley Bridge.
South Pittsburgh Water Filter Plant.
Shelby Steel Tube Company.
Spang Chalfant Company, Etna, Pa.
Testing Laboratory of U. S. Bureau of Standards.
United Engineering & Foundry Company.
Universal Portland Cement Company.
Union Switch & Signal Company.
Walker Soap Factory & Reduction Works.
Westinghouse Machine Company.
Westinghouse Electric & Manufacturing Company.

LIBRARIES

1. THE UNIVERSITY LIBRARY. The total number of volumes in this Library is about 9000. This includes 2,500 volumes bequeathed to the University by Robert Watson, Esq. The endowment known as the Richard Edwards, Jr., Memorial Fund, given by Mrs. George B. Edwards, provides an annual revenue for the purchase of new books. The Reading Room is at present maintained in connection with the Library and is well supplied with the leading literary and scientific periodicals.

2. DEPARTMENT LIBRARIES. The Departments of Physics, Chemistry, Psychology, the Schools of Engineering and of Mines, and the Observatory, are supplied with libraries having special reference to the needs of the several departments. The total number of volumes in these different departments is about 6,000.

3. THE CARNEGIE LIBRARY OF PITTSBURGH, is a free reference and circulating library maintained by the city. The main building, in which the greater part of the collection is kept, is situated at the entrance to Schenley Park, within two minutes' walk of the School of Engineering. The library contains about 350,000 volumes. Of these 55,000 are on technical and scientific subjects and constitute the Department of Technology. This collection consists of the best modern works in all branches of science and technology, including sets of over three hundred journals and periodicals. About the same number of current magazines are received as soon as issued. The Department is under the charge of graduates of scientific institutions, who are always ready to give personal assistance to those seeking information along technical lines. The students of the University have the use of these books at all times, and are entitled to take out circulating volumes for home use without charge.

Carnegie Library.

MUSEUMS AND LABORATORIES

1. **The Smith Cabinet.** This collection was formed by the two sisters whose name it bears, and is rich in beautiful mineralogical and zoölogical specimens. Especially is it noteworthy for the size and beauty of the objects from the mineral kingdom, already in place, and every year valuable additions are made, through the generosity and personal attention of the founders, of the same exceptional excellence as those with which the collection was begun, thus making it of increasing value as an exhibit as well as a basis of instruction. For the present it is stored until some of the rooms belonging to the School of Mines can be vacated by the College.

2. **The Mineralogical Laboratory** is equipped with thousands of specimens and the latest improved apparatus for lecture purposes, and the students' laboratory work in crystallography, mineralogy, and petrography and zoölogy. The means of instruction are quite fully given in the Bulletin of the School of Mines which will be sent to any address on application.

3. **The Geological Collection.** Besides the special geological collections arranged in the laboratories and lecture-rooms of the School of Mines, the arrangements made through the courtesy of the Director and Trustees of the Carnegie Museum, with part of the staff, afford abundant opportunity for paleontological study.

4. **The Engineering Museum.** This collection was made by Professor Stewart for the special purpose of having at hand material for illustration in the course of Mechanical Engineering. The amount of material is not extensive, but careful selection and a preparation of much of it by cross-sectioning for a better exhibit of working parts has resulted in a collection of considerable value for purposes of general instruction.

5. **The Mining Laboratory** is being equipped with models and with machines of unusual size employed in practical mining; and plans are partially completed for reopening and completely equipping a mine located on the University Campus, near the School of Mines Building. The needed apparatus and illustrative material for the study of general mining and practice in mining surveying is being acquired.

6. **The Assaying and Metallurgical Laboratories** are equipped with gas, coke and gasoline furnaces for fire assaying and metallurgical experimentation, while the laboratories are in the process of being fitted up for wet assaying and metallography.

7. **The Chemical Laboratories.** These, with the lecture room, occupy the entire third floor of the Engineering Building. Both lecture room and laboratories have been newly equipped throughout in the most modern manner. Separate laboratories have been installed in the follow-

ing branches: Introductory Chemistry and Qualitative Analysis; Quantitative Analysis and Food Analysis, with Balance Room in Connection; Gas and Fuel Analysis; Water Analysis; Organic Chemistry; Physical and Electro-Chemistry; Spectroscopy; Photography; Micro Chemistry and Research. On the fourth floor there is a special room for preparation and storage of distilled water, which is delivered by gravity to the various laboratories where it is on tap. A spacious store-room permits the distribution of supplies in such a manner that the requirements of students are promptly met. Machinery for suction and air pressure has been installed and a first class ventilating system provided so that the air in the laboratories may be pure at all times. The department library is well supplied with works of reference on chemistry for students' use.

8. PHYSICAL LABORATORIES. These are on the first and second floors of the Engineering Building. The lecture-room and large apparatus-room adjoining are on the first floor. The lecture-room has a seating capacity of 150, and is provided with all the appliances to facilitate a complete course of experimental lectures.

The general physical laboratory on the second floor is very fully equipped with new apparatus, and is complete in its appointments in every respect. Smaller laboratories are provided for photometry, advanced laboratory practice and research.

A well-equipped shop and mechanician provide excellent facilities for making and repairing apparatus.

The equipment of the department is new and includes an excellent collection of instruments for accurate measurement and investigation.

9. THE BIOLOGICAL LABORATORIES are in three rooms on the second floor of State Hall. Each student working in this department is provided with a compound microscope, for which he is personally responsible. The Laboratory is provided with two incubators—one for bacteriological work, the other for vertebrate embryology. The equipment includes a Spencer rotary microtome, which is of great value in preparing serial sections of embryos, etc., also an autoclav, paraffin baths, slide microtomes, physiological apparatus, micrometer balances, bacteriological apparatus, aquaria, etc.

10. THE PSYCHOLOGICAL LABORATORY, in State Hall, is provided with apparatus for practical experiments and demonstrations for the courses in psychology and for use in experimental study. The laboratory has the chief pieces of apparatus required in the manuals by Sanford and Titchner, besides supplementary pieces.

There is also a good collection of models of the brain and the sense organs including Auzoux models of brain, eye and ear; Ziegler models of the embryology of the human brain; the His models; and an assortment of materials for demonstration.

11. STEAM LABORATORY. There is provided the usual equipment for measuring the pressure, temperature and flow of steam such as gauges, thermometers, calorimeters, condensers, and indicators, together with suitable apparatus for standardizing and calibrating these.

12. ENGINE AND POWER LABORATORY. The equipment for this department includes the following:

A Babcock & Wilcox 100 H. P., 200 pound pressure, boiler, with a superheating chamber, to be used in experimental and power plant work.

A complete cross-compound steam engine, 7½ inches and 18 inches by 14 inches, to be arranged to run condensing or noncondensing, high-pressure cylinder controlled by single-valve, low-pressure cylinder controlled by four valves; Corliss type. The engine is provided with a friction-brake, which serves for applying loads. Either side may be operated as a simple engine condensing or noncondensing.

A two-cylinder Westinghouse gas-engine, provided with all necessary apparatus for making gas-engine tests; to be used for experimental purposes. In addition to this there are two three-cylinder Westinghouse gas-engines for power purposes located in the laboratory.

A motor-driven air-compressor for furnishing air for laboratory needs, and arranged to be used for experimental purposes.

13. MATERIALS TESTING LABORATORY. This laboratory, when installation is complete, will be equipped with machines and instruments for the measurement of the physical properties of the materials of construction, and for tests on manufactured specimens.

Universal Testing Machines. This equipment includes three testing machines, ranging from 50,000 pounds to 200,000 pounds capacity, for tension, compression, and flexure tests. The 200,000-pounds capacity machine is capable of taking 15-foot columns, tension specimens accordingly, and flexure specimens up to 20-foot lengths.

Torsion Machine. This machine is designed for 230,000 inch-pounds, with a three-inch chucking capacity, and will care for lengths up to 15 feet.

Flexure Machine. This is a hand-power machine of 5,000 pounds capacity.

Cement-Testing Apparatus. The equipment includes two automatic briquette-testing machines, standard molds, scales, sieves, moist closet and other similar apparatus necessary for the examination of cement, cement-mortars and concrete.

Structural materials testing apparatus consists of experimental shearing and punching attachments for testing-machines, special extenso-meters for structural specimens, and a Hanna pneumatic riveter which has a capacity of 100,000 pounds die pressure.

14. HYDRAULIC LABORATORY. For hydraulic experiments there are a Worthington two-stage turbine pump, driven by a variable-speed motor

a Pelton Wheel, and receiving and measuring tanks with weir discharge. There are also water-meters, orifices, nozzles, a Venturi meter, etc.

15. Elementary Mechanical Laboratory. The School of Engineering will occupy sections of the new Elementary Mechanical Laboratory This Building when completed will cover an area of about 460 feet long and 40 feet wide.

The first sections to be erected will be devoted to heat treating, forging and casting of metals. To permit the study of up-to-date processes of working metals, the laboratory will contain representative types of forges and furnaces fired with coke, gas, and oil; drop forge equipment; the necessary apparatus and appliances for electric, oxy-acetylene, and thermit welding; equipment for brazing; and pneumatic riveting; and the cold pressing, punching and drawing of metals.

This laboratory will also afford facilities for bench, floor, and machine molding; core making; and the running of heats in iron, brass and aluminum. The equipment will include a standard cupola, special furnaces for iron and brass, core ovens, representative molding machines, annealing furnace, tumbling barrel, and other foundry appurtenances.

A special room will be equipped for the more scientific study of the heat treatment of metals and will include barium chloride, lead, tempering, and annealing furnaces; pyrometers; etc.

16. Electrical Engineering Laboratories. Dynamo Room.

The Dynamo Room is equipped with representative types of the different classes of electrical machinery. This includes direct current generators, both constant and variable speed direct current motors, direct current and alternating current series motors, single phase and polyphase alternating current generators, single phase and polyphase alternating current induction motors, single phase and poly-phase alternating current synchronous motors, two phase, three phase and six phase synchronous converters, an a. c.-d. c. motor-generator set, induction regulators, various transformers, etc., to the number of about thirty pieces.

A motor driven air compressor of the type common in interurban and street car practice and a General Electric mercury arc rectifier are also included in the equipment of this room.

The laboratory is well equipped with accessory apparatus. This includes load, starting and field rheostats, dynamometers, brakes, switches, circuit breakers, the necessary portable and switchboard type measuring instruments, and a large floor crane to facilitate rapid arrangement of apparatus for special tests.

A well appointed three-panel switchboard located in the laboratory receives direct current power at 110 volts and 220 volts from the University power plant and single phase and poly-phase alternating current power from the Public Service Corporation mains and distributes it to any part of the laboratory.

In addition to the foregoing, a 60,000 volt transformer is installed in a small building permitting valuable tests. A large storage battery supplies direct current at constant voltage for special tests and furnishes at the same time suitable material for storage battery work. The University power plant is available for special work when desirable.

17. Electrical Engineering Laboratories. Standards Room.
One room is set apart for accurate work in standardizing the apparatus used in the electrical tests. This room is supplied with power by means of special circuits and a special distributing panel, and is equipped with standards of resistance, inductance and capacity. A Weston laboratory standard voltmeter and a certified Wolff potentiometer provides for accurate and rapid calibration of the measuring instruments. The usual complement of keys, switches, galvanometers, etc., is at hand.

18. Electrical Engineering Laboratories. Photometer Room.
A dark room is equipped with a ten-foot photometer bench, a universal rotator of the National Bureau of Standards type, a Hefner primary standard, secondary standards, Bunsen screens, etc., for making all kinds of tests of incandescent lamps, with and without shades.

METHODS OF ADMISSION

1. Certificates from Accredited Schools. Certificates from high schools and academies whose work has been approved by the University, and whose courses prepare for the Freshman class will be accepted. The official blank of certificate provided by the University must be used. It may be obtained, by application, from the Registrar. When filled, it must be transmitted directly to the Committee on Admission, through the Registrar, together with a letter from the Principal furnishing the certificate or certificates. There must be a precise designation, as provided for on the blank, of the school which the applicant desires to enter.

2. Certificates of the College Entrance Examination Board. Beginning with June 16, 1913, examinations conducted by the University for admission to the Freshman class, for which a definite time and schedule are provided in its own calendar will be discontinued. All who desire such examination, wholly or in part, are expected to apply and register directly for the same with the College Entrance Examination Board, Dr. Thomas S. Fiske, Secretary, Sub-station 84, New York City. These examinations are held in June annually and for the year 1913-14 begin on the date given above. They may be taken at any place most convenient including the University. Definite dates for succeeding years will appear later. Information regarding times and places may be obtained either from the Secretary of the Board or from the Registrar of the University.

3. From Other Colleges. Students from other colleges, whose entrance requirements are equivalent to those of the University of Pittsburgh, and which offer equivalent courses of study, will be credited with the work they have done in such colleges, and admitted to advanced standing without examination.

REQUIREMENTS FOR ADMISSION

All candidates for admission to the School of Engineering must be at least sixteen years of age and furnish testimonials of good moral character. Those who come from other colleges must present certificates of regular dismissal.

The student applying for admission must offer fifteen units, a unit being a subject in which the work done is the equivalent of four recitations per week of one hour each for one year, or five of three-quarters of an hour each.

For admission to the School of Engineering the student must offer ten units, in following subjects:

English, *a,* 3 units.
Mathematics, *a, c,* Algebra, 1½ units.
Mathematics, *b, d,* Plane and Solid Geometry, 1½ units.
History, *a, b, c,* or *d,* 1 unit.
German or French, *a, b,* 2 units.
Physics, 1 unit.

Five additional units must be offered from following subjects:

Chemistry, 1 unit.
Biology, 1 unit.
Drawing, 1 unit.
Physiography, ½ unit.
Shop Work, 1 unit.
Advanced History, 1 unit.
Advanced English, 1 unit.
Latin, *a, b,* 1 to 2 units.
German, 2 units.
French, 2 units.
Trigonometry, ½ unit.

CONDITIONS

No student with more than three units of entrance conditions will be admitted to regular classification. Conditions must be partly removed before the second year and wholly before the third.

Advanced Standing—Students entering with more than 15 units may receive college credit for high school work in excess of the 15 only by taking special examination in this work on entering the University.

Students in the School of Engineering who fail to pass in 50 per cent of their work will not be registered in the following term except by special action of the faculty.

TUITION AND FEES

The tuition covers all fees except those specified below and must be paid upon registration, with all current fees, before name can be entered on class rolls.

Tuition

First term, every year	$ 40.00
All other terms, each	35.00
If paid in advance for three (3) terms	105.00

Fees

Matriculation, payable on admission to University	$ 5.00
Diploma	5.00
Gymnasium, each term	2.00
Chemistry, each course	5.00
Physics, each laboratory course	5.00
Biology, one course	3.50
Biology, each additional course	1.75
Engineering Laboratory, each term	5.00
Shop, each term	5.00

DEGREES IN ENGINEERING

The degrees conferred upon those who have been in residence during their last year and who shall complete satisfactorily the courses offered by the School of Engineering will be respectively:

Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, Bachelor of Science in Electrical Engineering, Bachelor of Science in Chemical Engineering, Bachelor of Science in Sanitary Engineering.

Thesis. A thesis is required of every candidate for any one of the degrees given. The thesis subject, together with an outline of the work proposed, must be approved by the head of the department in which the student is classified, not later than January 15th preceding commencement; and when so approved will be assigned him on a blank furnished for the purpose. A memorandum of this assignment must be filed in the office of the Dean.

The thesis in the proposed final form should be submitted to the Professor in charge at least two weeks prior to commencement.

The results obtained and the thesis prepared in connection with a regularly assigned thesis subject are the property of the University and no part of the thesis may be published without the consent of the Chancellor.

Upon giving evidence of having successfully practiced engineering for a period of at least three years, accompanied by a satisfactory thesis showing the application of engineering principles to some important project, the corresponding engineering degree will be conferred upon graduates of this school.

ADVANCED STANDING IN ENGINEERING COURSES

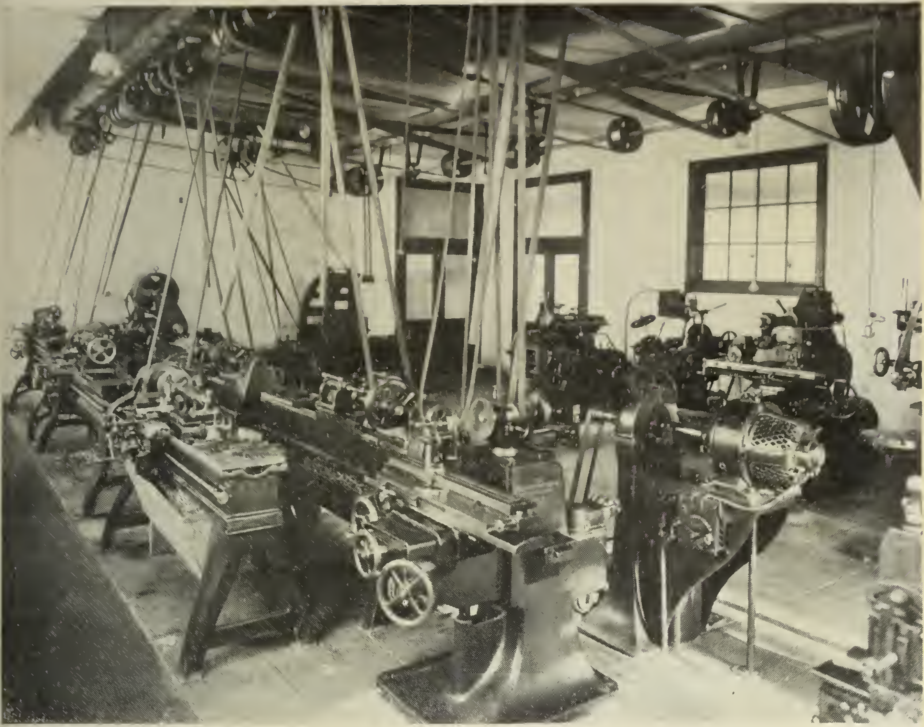
Graduates of the College of this University, or of any other college of high standing, who desire to prepare themselves for the engineering profession, will be matriculated in the School of Engineering upon presentation of their diplomas and evidence that they have pursued mathematical and scientific studies justifying their entering one of the advanced classes. By availing themselves of this provision graduates from classical or general scientific courses may obtain a professional training in engineering in two or three years after taking a first degree, and may enter upon their practical work with a broader education than can be obtained by taking a regular engineering course. Students of the University, in the College, will be advised as to the best selection of electives to make, to the end that they may enter an engineering course for an additional degree at as high a point as possible and with the fewest conditions.

COURSES IN ENGINEERING

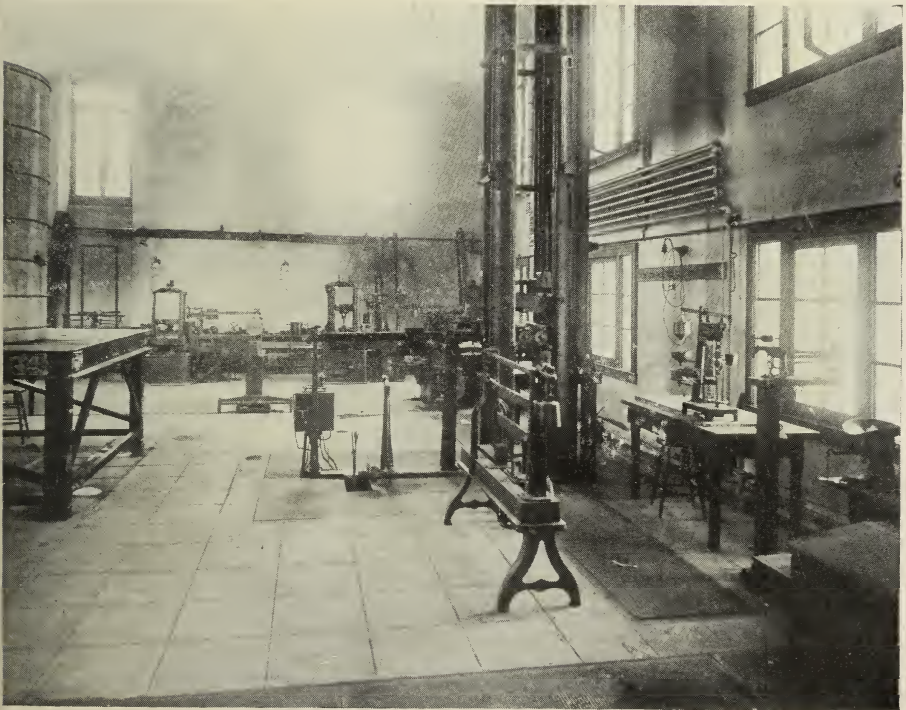
The several courses in engineering, are planned to meet fully the requirements of prospective engineers, but are subject to some modification in the case of students who are preparing for a special branch of the engineering profession. Proposed substitutes for prescribed courses must be approved by the heads of the departments concerned, at least two weeks before the beginning of the term in which such courses are scheduled.

All regular courses are made up of eleven terms of eleven to twelve weeks each, spent in school, and four terms spent in the engineering industries of the Pittsburgh district, making a total of fifteen terms' work required for graduation.

The schedule of work in the Co-operative plan adopted is as follows: during the Freshman year, the last term of the Sophomore year, and the whole of the Senior year, all students of the same class are together in school. During the rest of the time, each class is divided into two sections which alternate quarterly between school and practical work. The first year's work is the same for all, and lays a broad foundation for any engineering course, at the same time giving the student a year in which to become so familiar with the different courses that he may decide which to pursue, with greater confidence in his choice.



Machine Laboratory



200,000 Pound Universal Testing Machine

COURSE IN CIVIL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 6	45	5	5	7	45	5	5	8	45	5	5
Chem	4–7	45	8	4	5–8	46	8	4	8	46	6–9	4
Graph	1	22	3	1	2	22	6	2	3	22	3	1
M. Eng	1a	28	7	3	2a	29	7	3	3a	29	7	3
C. Eng	.....	.....	.....	.....	.....	.....	.....	.....	1	24	5	3
Ger. or Rom.	1	52	3	3	2	52	3	3	3	51	3	3
Engl.	4	51	4	4	5	51	4	4	6	50	3	3
Phys. Ed	.....	.....	3	1	.....	.....	3	1	.....	.....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	45	5	5	10	45	5	5	.....	.....	.....	.....
Phys.	11	46	7	5	12	46	7	5	13	46	7	5
Graph	4	22	6	2	5	22	8	4	.....	.....	.....	.....
C. Eng	2	24	7	3	3	24	3	1	5	25	8	4
C. Eng	.....	.....	.....	.....	19	28	1	1	19	28	1	1
C. Eng	.....	.....	.....	.....	5A	24	2	2	.....	.....	.....	.....
Psych.	.....	.....	.....	.....	4	49	5	4	.....	.....	.....	.....
Biol.	.....	.....	.....	.....	.....	.....	.....	.....	3	48	4	2
Min.	.....	.....	.....	.....	.....	.....	.....	.....	1	50	6	2
Mech	.....	.....	.....	.....	.....	.....	.....	.....	1	23	5	5
Ger. or Rom.	7	53	3	3	8	53	3	3	.....	.....	.....	.....
Engl.	*7	51	3	3	.....	.....			.....	.....	.....	.....
Phys. Ed	.....	.....	3	1	.....	.....	3	1	.....	.....	3	1
*or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech.	2	23	5	5	.....	.....	.....	.....		.....		
Mech.	3	23	3	1	.....	.....	.....	.....		.....		
Mech.	4	23	7	3	.....	.....	.....	.....		.....		
S. Eng.	.....	.....	.....	.....	1	38	5	5		.....		
S. Eng.	.....	.....	.....	.....	2	38	3	1		.....		
C. Eng	6	25	4	2	7	25	2	2		.....		
C. Eng	19	28	1	1	19	28	1	1		.....		
C. Eng	.....	.....	.....	.....	15	27	5	5		.....		
E. Eng	2	35	5	3	.....	.....	.....	.....		.....		
M. Eng.	.....	.....	.....	.....	4	30	5	3		.....		
Geol.	1	50	3	3	3	50	3	3		.....		
Econ	3E	43	3	3	.....	.....	.....	.....		.....		
Astron.	.....	.....	.....	.....	1	50	3	3		.....		
	FALL TERM				WINTER TERM				SPRING TERM			
S. Eng.	.....	.....	.....	.....	7	39	11	3	11	40	4	2
C. Eng	4	24	6	4	10	26	5	2	12	26	5	3
C Eng	8	26		3	11	26	7	3	.....	.....	.....	.....
C. Eng	9	26	5	2	.....	.....	.....	.....	18	27	10	4
C. Eng	16	27	10	4	17	27	10	4	.....	.....	.....	.....
C. Eng	19	28	1	1	19	28	1	1	19	28	1	1
C. Eng	20	28	3	1	20	28	3	1	20	28	3	1
C. Eng	7A	26	.....	.....	21	28	.....	2	21	28	.....	4
Econ	10	44	2	2	11	44	2	2	.....	.....	.....	.....
Econ	.....	.....	.....	.....	16	44	2	2	46	45	3	3
Econ	21	44	2	2	24	44	2	2	.....	.....	.....	.....
M. Eng	.....	.....	.....	.....	.....	.....	.....	.....	15	33	5	3

COURSE IN MECHANICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 6	45	5	5	7	45	5	5	8	45	5	5
Chem	4–7	46	8	4	5–8	46	8	4	6–9	46	8	4
Graph	1	22	3	1	2	22	6	2	3	22	3	1
M. Eng	1a	28	7	3	2a	29	7	3	3a	29	7	3
C. Eng									1		5	3
Ger. or Rom	1	52	3	3	2	52	3	3	3	52	3	3
Engl	4	51	4	4	5	51	4	4	6	51	3	3
Phys. Ed			3	1			3	1			3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	45	5	5	10	45	5	5				
Phys	11	46	7	5	12	46	7	5	13	45	7	5
Graph	4	22	6	2	5	22	8	4				
Mech									1	23	5	5
M. Eng	4a	29	4	2	5a	29	4	2	6a	30	7	3
Ger. or Rom	7	53	3	3	8	53	3	3	9	53	3	3
Engl	*7	51	3	3								
Min									1	50	6	2
Psych					4	49	5	5				
Phys. Ed			3	1			3	1			3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	23	5	5								
Mech	3	23	3	1								
Mech	4	23	7	3								
S. Eng					1	38	5	5				
S. Eng					2	39	3	1				
M. Eng	1	30	5	3	3	30	9	5				
M. Eng	2	30	5	3								
*M. Eng	17	34	3	1	17	41	3	1				
E. Eng	3	35	5	3	4	42	5	3				
C. Eng					7	39	2	2				
Phys					15a	54	4	2				
Econ	3E	43	3	3								
	FALL TERM				WINTER TERM				SPRING TERM			
M. Eng					6	31	2	2	10	32	3	3
M. Eng	5	31	3	4	11	32	5	3	7	31	4	2
M. Eng	16	34	4	1	8	32	4	2	12	33	5	3
M. Eng	17	34	3	1	9	32	7	3	14	33	3	1
E. Eng	5	35	5	3								
C. Eng	16	27	10	4								
C. Eng	9	26	6	2								
M. Eng					13	33	6	2	15	33	5	3
M. Eng									16	34	3	1
M. Eng					17	34	3	1	17	34	3	1
M. Eng					18	34		3	18	34		3
Econ	13	44	2	2	16	44	2	2	46	46	3	3
Econ	21	44	2	2	24	45	2	2				

* One credit each required in Fall, Winter, Spring and Summer Terms

COURSE IN ELECTRICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5 6	45	5	5	7	45	5	5	8	45	5	5
Chem	4-7	46	8	4	5–8	46	8	4	6–9	46	8	4
Graph	1	22	3	1	2	22	6	2	3	22	3	1
M. Eng	1a	28	7	3	2a	29	7	3	3a	29	7	3
C. Eng	....	....	....	....	....	....	....	....	1	24	5	3
Ger. or Rom	1	52	3	3	2	52	3	3	3	52	3	3
Engl	4	51	4	4	5	51	4	4	6	51	3	3
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	45	5	5	10	45	5	5	....	....	....	....
Phys	11	46	7	5	12	46	7	5	13	45	7	5
Graph	4	22	6	2	5	22	2	8	....	....	....	....
Mech	....	....	....	....	....	....	....	....	1	23	5	5
M. Eng	4a	29	4	2	5a	29	4	2	6a	30	4	2
Ger. or Rom	7	53	3	3	8	53	3	3	9	53	3	3
Engl	*7	51	3	3	....	....	....	....	....	....	....	....
Min	....	....	....	....	....	....	....	....	1	50	6	2
Psych	....	....	....	....	4	49	5	5	....	....	....	....
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
* or 15												
	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	23	5	5	....	....	....	....				
Mech	3	23	3	1	....	....	....	....				
S. Eng	....	....	....	....	1	38	5	5				
S. Eng	....	....	....	....	2	39	3	1				
Phys.	14	46	7	3	15	46	7	3				
E. Eng	1	34	5	5	6	35	5	5				
E. Eng	15	37	4	2	16	37	4	2				
E. Eng	....	....	....	....	23	38	2	2				
M. Eng	2	30	5	3	2b	30	3	1				
Econ	3E	43	3	3	....	....	....	....				
	FALL TERM				WINTER TERM				SPRING TERM			
E. Eng	7	35	3	3	8	36	3	3	9	36	3	3
E. Eng	10	36	3	3	11	36	3	3	12	36	3	3
E. Eng	13	36	6	2	14	36	6	2	14a	36	6	2
E. Eng	17	37	6	2	18	37	6	2	19	37	6	2
E. Eng	20	37	1	1	20	37	1	1	20	37	1	1
E. Eng	21	38	3	1	21	38	3	1	21	38	3	1
E. Eng	....	....	....	....	22	38	3	1	22	38	3	1
E. Eng	24	38	2	2	25	38	2	2	26	38	2	2
Phys	....	....	....	....	30	46	3	3	31	46	3	3
M. Eng	4b	31	7	5	....	....	....	....	....	....	....	....
Econ	13	44	2	2	16	44	2	2	46	45	....	....
Econ	21	44	2	2	24	45	2	2	....	....	3	3

COURSE IN SANITARY ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Math	5&6	45	5	5	7	45	5	5	8	45	5	5
Chem	4–7	46	8	4	5–8	46	8	4	6–9	46	8	4
Graph.	1	22	3	1	2	22	6	2	3	22	3	1
M. Eng.	1 A	28	7	3	2A	29	7	3	3A	29	7	3
C. Eng	....	....	....	....	....	....	....	....	1	24	5	3
Ger. or Fr	1	52	3	3	2	52	3	3	3	52	3	3
Engl.	4	51	4	4	5	51	4	4	6	51	3	3
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Math	9	45	5	5	10	45	4	4	....	....	....	....
Chem	20	47	7	3	21	47	7	3	22	47	7	3
Phys.	11	46	7	5	12	46	7	5	13	46	7	5
C. Eng	2	24	7	3	3	24	3	1	....	....	....	....
Ger. or Fr.	7	53	3	3	8	53	3	3	9	53	3	3
Mech	....	....	....	....	....	....	....	....	1	23	5	5
Biol	....	....	....	....	....	....	....	....	3	48	4	2
Eng.	7 *	51	3	3	....	....	....	....	....	....	....	....
Phych	....	....	....	....	4	49	5	5	....	....	....	....
Min	....	....	....	....	....	....	....	....	1	50	6	2
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
(* or 15)	FALL OR WINTER TERM				SPRING OR SUMMER TERM							
Mech	2	23	5	5	....	....	....	....				
Mech	3	23	3	1	....	....	....	....				
Mech	4	23	7	3	....	....	....	....				
S. Eng	....	....	....	....	1	38	4	5				
S. Eng	....	....	....	....	2	39	3	1				
S. Eng	....	....	....	....	3	39	7	3				
S. Eng	12	40	1	1	12	40	1	1				
Biol.	17	47	7	4	18	48	7	4				
Geol	1	50	3	3	3	50	3	3				
Econ	3E	42	3	3	....	....	....	....				
C. Eng	....	....	....	....	7	25	2	2				
M. Eng	....	....	....	....	4	30	5	3				
	FALL TERM				WINTER TERM				SPRING TERM			
S. Eng	4	39	6	2	5	39	2	2	9	40	5	3
S. Eng	....	....	....	....	6	39	2	2	8	39	7	3
S. Eng	....	....	....	....	7	39	4	2	11	40	4	2
S. Eng	....	....	....	....	10	40	8	4	....	....	....	....
S. Eng	12	40	1	1	12	40	1	1	12	40	1	1
S. Eng.	13	40	3	1	13	40	3	1	13	40	3	1
S. Eng	14	40	1	1	14	40	1	1	14	40	1	1
S. Eng	....	....	....	....	15	41	....	2	15	41	....	5
Biol.	19	49	7	4	....	....	....	....	....	....	....	....
Biol.	21	49	2	2	....	....	....	....	....	....	....	....
C. Eng	8	26	3	3	....	....	....	....	....	....	....	....
C. Eng	9	26	6	2		....	....	....	....	....	....	....
C Eng	16	27	10	4	11	26	7	3	12	26	3	3
Econ	21	43	3	3	16	44	2	2	46	45	3	3
Econ	....	....	....	....	32	45	2	2	....	....	....	....

COURSE IN CHEMICAL ENGINEERING

SUBJECT	FALL TERM				WINTER TERM				SPRING TERM			
	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.	No.	Pgs.	Hrs.	Cdts.
Mathematics	5–6	45	5	5	7	45	5	5	8	45	5	5
Chemistry	4–7	46	8	4	5–8	46	8	4	6–9	46	8	4
Graphics	1	22	3	1	2	22	6	2	3	22	3	1
Mech Eng	1a	28	7	3	2a	29	7	3	3a	29	7	3
German	1–4	52	3	3	2–5	52	3	3	3–6	52	3	3
English	4	51	4	4	5	51	4	4	6	51	3	3
Civil Eng	....	....	....	....	....	....	....	....	1	24	5	3
Phys. Ed	....	....	3	1	....	....	3	1		....	3	1
	SUMMER OR FALL TERM				WINTER OR SPRING TERM				SUMMER TERM			
Mathematics	9	45	5	5	10	45	4	4	....	....	....	....
Physics	11	46	7	5	12	46	7	5	13	46	7	5
Graphics	4	22	6	2	....	....	....	....	....	....	....	....
Chemistry	20	51	7	3	21	47	7	3	22	47		
Eng.	7*	51	....	....	....	....	....	....	....	....	....	....
*German	7	52	3	3	8	52	3	3	9	52	3	3
†German	7a	52	2	2	8a	52	2	2	9a	53	2	2
Mechanics	....	....	....	....	....	....	....	....	1	23	5	5
Mineralogy	....	....	....	....	....	....	....	....	1	50	6	2
Phys. Ed	....	....	3	1	....	....	3	1	....	....	3	1
(* or 15)	FALL OR WINTER TERM				WINTER OR SPRING TERM							
Mech	2	23	5	5		....						
Mech	3	23	3	1		....						
Chem	40	47	8	4	41	47	8	4				
Chem	50	47	2	2	51 52	47	2	2				
M. Eng	2	30	4	2	2b	30	3	1				
Econ	3e	43	3	3	......	....	....	......				
Option 1												
E. Eng	2	35	5	3	......	....	......	......				
M. Eng	......	....	......	......	4	30	5	3				
Metall	1	50	6	4	......	....	....	......				
Option 2												
E. Eng	3	55	5	3	4	35	5	3				
Metall	1	50	5	3	2	50	5	3				
	FALL TERM				WINTER TERM				SPRING TERM			
Chem	100	48	2	2	101	48	2	2	102	48	2	2
Econ	13	44	2	2	16	45	2	2	46	45	3	3
Ind. Chem. Lab	....	....	....	3		....	....	3	....	....	....	3
Thesis	......	....	......	.. ..	....	....	....	....	....	....	....	......
‡ M. Eng	5	31	4	4	11	32	5	3	....	....	....	......
Metall	......	....	......	......	....	....	....	....	3	50	5	3
‖ Elec. Eng	5	35	5	3	....	....	....	....	....	....	....	......
Electro Metall	19	51	5	5	20	51	5	5	21	....	5	5
§ Chem	46	48	......	3	47	48	....	3	48	51	....	3
Biol	17	48	7	2	18	48	7	4	....	48	....	......

* For those taking Ger. 1, 2 and 3 in 1st year.
† For those taking Ger. 4, 5 and 6 in 1st year.

‡ Option 1.—To follow Optional Group 1. 3rd year.
‖ Option 2.—To follow Optional Group 2, of 3rd year.
§ Option 3.—To follow Optional Group 1, of 3rd year.

Graphics

1. Mechanical Drawing

Professor Lambie and Mr. Chamberlin — Fall Term, 1 credit

The care and use of drafting instruments, instrument exercises, geometrical constructions, lettering, shading, exercises in drawing to scale, and dimensioning.

Three hours per week in drafting room. Freshman year.

2. Mechanical Drawing

Professor Lambie and Mr. Chamberlin — Winter Term, 2 credits

Orthographic projections, rotation of objects, oblique projections, intersections, and development of surfaces.

Six hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 1.

3. Mechanical Drawing

Professor Lambie and Mr. Chamberlin — Spring Term, 1 credit

Isometric drawing and dimensioning, sectioning, and machine drawing.

Three hours per week in drafting room. Freshman year.

Pre-requisite: Graphics 2.

4. Mechanical Sketching and Drafting

Summer or Fall Term, 2 credits

Graded exercises in the measuring and sketching of mechanical constructions, and the subsequent detail drafting of the same.

Six hours per week in drafting room. Sophomore year.

Pre-requisite: Graphics 3.

5. Descriptive Geometry

Professor Lambie and Mr. Chamberlin

Winter or Spring Term, 4 credits

Winter or Spring and Summer Term, 2 credits each term

A critical study of the science of representing by drawing. The location of points, lines, planes, single-curved surfaces, surfaces of revolution, and warped surfaces, with their relations to each other; tangent lines and planes; intersection of surfaces; shades, shadows, and perspective.

Two lectures and six hours in drafting room per week. Sophomore year.

Pre-requisites: Graphics 4; Mathematics 7.

6. APPLIED DESCRIPTIVE GEOMETRY

PROFESSOR SMITH 2 credits

The application of descriptive geometry and advanced drawing to engineering problems, including patterns of the developable surfaces, templets in true proportions, and detailed isometric drawings of various parts of the structures. Also, practice in the construction of templets, patterns, etc., with their use.

Six hours drawing per week.

Elective in all engineering courses.

Pre-requisite: Graphics 5.

Mechanics

1. ANALYTIC MECHANICS

PROFESSOR WENRICH Spring or Summer Term, 5 credits

This subject comprises among its topics the composition and resolution of forces, the center of gravity, the moment of inertia, radius of gyration, laws of friction and of motion, projectiles, impact, machines, work, and energy. The solution of numerous problems in application of formulas is constantly required.

Five recitations and lectures per week. Sophomore year.

Pre-requisite: Mathematics 10.

2. MECHANICS OF MATERIALS

PROFESSOR LAMBIE Fall or Winter Term, 5 credits

The resistance and elasticity of materials. The action of beams under various conditions of fixity and loading; strength of columns and shafts; combined stresses; resilience of materials; etc.

Five recitations and lectures per week. Junior year.

Pre-requisite: Mechanics 1.

3. MECHANICAL LABORATORY

MR. WEBER Fall or Winter Term, 1 credit

The experimental study of the physical properties of the materials of construction, such as iron and steel, wood, brick, stone, cement, and concrete.

Three laboratory-hours per week. Junior year.

To be taken concurrently with Mechanics 2.

4. GRAPHIC STATICS

PROFESSOR LAMBIE Fall or Winter Term, 3 credits

The solution of problems in which the stresses in frame work, beams, roof and bridge trusses are ascertained by graphical methods. Methods for dead, snow, wind, and live loads.

One lecture and six hours drawing per week. Junior year.

Pre-requisites: Graphics 4; Mechanics 1.

Civil Engineering

1. SURVEYING

MR. MCCANDLISS AND MR. CHAMBERLIN Spring Term, 3 credits

Lectures, recitations, and field work in the theory, use, and care of surveying instruments. The field work consists of measuring lines and angles; determining areas, running levels, dividing of land, re-locating boundaries, staking out of buildings, etc. Methods of keeping notes are explained, and notes and plots are required of every student.

Two recitations and three hours' field work per week. Freshman year.

Pre-requisite: Mathematics 5.

2. TOPOGRAPHY

MR. MCCANDLISS Summer or Fall Term, 3 credits

A course in topographical surveying, including the theory and practice of transit, plane table and stadia methods. Also the applications of railroad, highway, municipal and hydrographical surveying.

A complete topographic survey is executed. Complete notes and a topographical map are required of every student.

One recitation and six hours field work per week. Sophomore year.

Pre-requisite: C. E. 1.

3. TOPOGRAPHY

MR. MCCANDLISS Winter or Spring Term, 1 credit

A continuation of Course C. E. 2.

Three hours' drawing per week. Sophomore year.

4. GEODESY

PROFESSOR SMITH AND MR. MCCANDLISS Fall Term, 4 credits

A study of the precise methods used in geodetic and topographical surveying. The mathematical development of the principles, and the application of the method of least squares, in finding the most probable values, and probable errors, of magnitudes observed in plane and geodetic surveys. Field work, including the measurement of base lines, triangulation and topography.

Three recitations and three hours' field work per week. Senior year.

Pre-requisites: C. E. 3; Mathematics 10; Astronomy 1.

5a. RAILWAY CURVES

MR. MCCANDLISS Winter or Spring Term, 2 credits

An elementary course in the theory of railway curves with sufficient practice to give familiarity with the field methods, so that the student may be prepared to undertake the more advanced Railway location.

Two recitation hours per week.

Pre-requisite: C. E. 1.

5. RAILROAD ENGINEERING, LOCATION

MR. MCCANDLISS — Summer Term, 4 credits

The reconnoissance, the preliminary survey, and the staking out of the center line. The student is required to perform the necessary mathematical calculations incident to the running of simple, compound, and transition curves, overcoming of obstacles, change of location, etc. The line is subsequently leveled, benches and reference points established, topography taken, and the profile made. The student is taught the best method of keeping the field notes and of checking them and is given exercises in the solution of problems pertaining to frogs and switches, turnouts and crossings, and the practical application of the same in the field.

Two recitations and six hours of field work per week. Sophomore year.

Pre-requisite: C. E. 3.

6. RAILROAD ENGINEERING, CONSTRUCTION

MR. MCCANDLISS. — Fall or Winter Terms, 2 credits

The student is given exercises in the means and methods of cross-sectioning, determination of grades, staking out excavations and embankments, calculating earth work, making estimates on haulage, together with the means and methods of excavation and cost of the work; the classification of earth work, staking out culverts, bridge-piers, abutments, and tunnels.

One recitation and three hours of calculations and estimates per week. Junior year.

Pre-requisite: C. E. 5.

7. MASONRY CONSTRUCTION AND FOUNDATIONS

PROFESSOR LAMBIE — Spring or Summer Term, 2 credits

A study of the preparation, strength, and durability of building stones, bricks, common lime mortar, hydraulic cement mortar, and concrete; and the different kinds of masonry construction, such as dams, retaining walls, bridge piers and abutments; also the preparation of ordinary foundations, pile foundations, caisson foundations, and foundations under water. Methods of tunneling. The nature and use of explosives. Visits of inspection are made, when the opportunity offers, to see work in the process of construction.

Two recitations and lectures per week.

Pre-requisite: Mechanics 4.

7a. MASONRY CONSTRUCTION AND FOUNDATIONS.

PROFESSOR LAMBIE Fall Term, 2 credits

A continuation of Course CE 7.

8. CONCRETE ENGINEERING

PROFESSOR LAMBIE Fall Term, 3 credits

A study of the mechanics of reinforced concrete, together with applications to the design of typical structures in buildings, bridges, etc. This course should be taken with C. E., 9.

Two lectures and three hours design per week.

Pre-requisites: Mechanics 2 and 4.

9. ENGINEERING LABORATORY

PROFESSORS SMITH AND LAMBIE Fall Term, 2 credits

This course comprises laboratory work generally related to structural engineering in steel and concrete.

Four laboratory hours and one recitation per week. Senior year.

Pre-requisites: Mechanics 2, 3, and 4.

10. ENGINEERING LABORATORY

PROFESSOR SMITH Winter Term, 2 credits

A continuation of Course C. E. 9.

Four laboratory hours and one recitation per week. Senior year.

11. ARCHES AND RETAINING WALLS

MR. MCCANDLISS Winter Term, 3 credits

Theory of arches; external forces; character of failure by sliding, rotation, crushing. Methods of testing, stability, criteria of safety. Location of the line of resistance. Symmetrical and unsymmetrical loading. Curvature of linear arches. Rules and formulas derived from practice.

Design of retaining walls, including dams and character of failure. Theoretical and empirical formulas.

One recitation and six hours design per week. Senior year.

Pre-requisite: C. E. 8.

12. ROADS AND PAVEMENTS

PROFESSOR LAMBIE Spring Term, 3 credits

A study of the location, width and transverse section of roads and streets, together with a study of the materials used and methods of constructing or improving the surfaces of roads and pavements.

Two recitations and three hours laboratory per week. Senior year.

Pre-requisites: Geology 1; and Mechanics 3.

15. STRESSES IN TRUSSES, AND BRIDGE DESIGN

PROFESSOR SMITH — Spring or Summer Terms, 5 credits

Methods of computing stresses in roof and bridge trusses. An account of the development of bridge building and the principles of economic design, followed by a complete analysis for the stresses of a roof truss, a plate girder bridge, a pin-connected bridge, and a critical study of other standard types.

Five recitations and lectures per week. Junior year.

Pre-requisites: Mechanics 2 and 4.

16. STRUCTURAL ENGINEERING

PROFESSOR SMITH — Fall Term, 4 credits

An elementary course in structural designing; including properties of rolled shapes of structural steel; structural shop methods; design and detailing of riveted joints, simple truss members, and minor trusses.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: Mechanics 4.

17. STRUCTURAL ENGINEERING

PROFESSOR SMITH — Winter Term, 4 credits

Structural engineering as applied in general; and detail designs of various steel-framed structures, including mill buildings, highway bridges, and plate-girder railroad bridges. The work consists of the complete analysis and design of the structures under a given set of specifications, followed by the practice of making complete general and detail drawings, with stress sheets, weight and cost data, and bills of material.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisites: C. E. 15 and 16.

18. STRUCTURAL ENGINEERING

PROFESSOR SMITH. — Spring Term, 4 credits

A study of pin-connected bridge trusses of the various types. The work includes the general design and determination of stresses; the detail design and detail drawings of the structure, with stress sheets, weight and cost data.

One lecture hour and nine hours in drafting room per week. Senior year.

Pre-requisite: C. E. 17.

19. CURRENT ENGINEERING TOPICS

1 credit per term

The object of this course is to increase the student's knowledge of engineering practice as well as to train him in the presentation and discussion of themes in general. Instructors and students of all classes meet on equal terms.

The work consists of original papers, reviews, and general discussions on subjects pertaining to science and engineering.

One session hour per week. Sophomore, Junior, and Senior year. Open to all students.

20. INSPECTION VISITS AND REPORTS

PROFESSORS SMITH AND LAMBIE 1 credit per term

One afternoon in each alternate week is spent in the large industrial plants or at the site of one of the notable engineering structures of the Pittsburgh district. A separate report dealing with the technical details of the inspection is required for each visit. Senior year.

Pre-requisites: C. E. 15.

21. THESIS

PROFESSOR SMITH Winter and Spring Terms, 3 credits each term

For the degree of B. S., in Civil Engineering, a thesis involving a large amount of original work in engineering must be presented in acceptable form and approved by the head of the department several days in advance of the date of graduation. The subject must be decided upon at a time not later than the ninth term of the student's course.

23. ELEMENTS OF MASONRY AND CONCRETE CONSTRUCTION

PROFESSOR LAMBIE Fall Term, 5 credits

This is an elementary course, designated to meet the needs of mining students. It comprises a brief outline of the theory, and a study of practical construction of reinforced concrete beams and slabs, masonry and concrete foundations, retaining walls and arches. The laboratory exercises include the testing of cements, sand, gravel, mortar, and concrete specimens.

Three lectures or recitations, and six laboratory hours per week. Required in Group I. School of Mines.

Mechanical Engineering

(1a) ELEMENTARY MECHANICAL LABORATORY

PROFESSOR WEBER AND ASSISTANTS Fall Term, 3 credits

The elementary study of casting design from the standpoint of moulding and founding. The student is required to mould a graded set of patterns. The lecture and recitation work covers the study of the properties of castings and the production of same on a commercial scale. Inspection trips are made to local foundries.

One lecture or recitation and six hours laboratory work per week. Freshman year.

(2a) ELEMENTARY MECHANICAL LABORATORY
PROFESSOR WEBER AND ASSISTANTS Winter Term, 3 credits

The elementary study of the treatment and properties of wrought iron, soft steel, and carbon tool steel. The student is required to forge and machine a number of representative test specimens which will bring out the characteristics and strength of materials. The lecture and recitation work covers the study of the properties of wrought metals, and the working and forging of same on a commercial scale. Inspection trips are taken to local industrial plants.

One lecture or recitation and six hours laboratory work per week. Freshman year.

(3a) ELEMENTARY MECHANICAL LABORATORY
PROFESSOR WEBER AND ASSISTANTS Spring Term, 3 credits

Machine elements and structural details are prepared and tested, and the results reported. The lecture and recitation work includes the discussion of the results of laboratory tests and the study of the elementary features of machine and structural design.

One lecture or recitation and six hours laboratory work per week. Freshman year.

(4a) ELEMENTARY MECHANICAL LABORATORY
PROFESSOR AND ASSISTANTS Summer or Fall Term, 2 credits

A continuation of 3a together with the heat treatment of various carbon and high speed tool steels, case-hardening, etc.

One lecture or recitation and three hours laboratory work per week. Sophomore year.

(5a) PROCESSES OF MANUFACTURE
PROFESSOR WEBER Winter or Spring Terms, 2 credits

The study of up-to-date processes of manufacture, by means of visits of inspection each alternate week accompanied with lectures and reference and text book study.

One lecture and recitation and three hours visiting or reporting per week. Sophomore year.

(6a) COSTS

PROFESSOR WEBER Summer Term, 3 credits

The study of costs with a view to familiarize the student with current prices of materials, cost of production, and the working up of a representative system of cost keeping for a manufacturing plant.

One lecture or recitation and six hours for estimating and cost keeping per week. Sophomore year.

1. KINEMATICS

PROFESSOR RITTER Fall or Winter Term, 3 credits

A study of the principles underlying the action of machine elements; the communication of motion by trains of gearing, pulleys, and belts; cams and link work; the different forms of gear teeth; automatic feed motions; quick return motions, etc.

Two recitations and three hours drawing per week. Junior year.

Pre-requisites: Graphics 5; Mechanics 1.

2. MACHINE DESIGN AND DRAWING

PROFESSOR WEBER Fall or Winter Terms, 3 credits

The proportioning and design of machine elements and the selection of material for same.

Two recitations and lectures and three drawing hours per week. Junior year.

Pre-requisites: Graphics 5; Mechanics 2; M. E. 1.

2b. MACHINE DESIGN AND DRAWING

PROFESSOR WEBER Spring or Summer Terms, 1 credit

Continuation of Course M. E. 2., for Electrical Engineering students.

Three hours drawing per week. Junior year.

Pre-requisite.—M. E. 2.

3. MACHINE DESIGN AND DRAWING

PROFESSOR WEBER Spring or Summer Terms, 5 credits

Continuation of Course M. E. 2., with the application of the knowledge thus gained to the complete design of machines to fulfil certain requirements.

Three recitations and lectures and six drawing hours per week. Junior

4. PRIME MOVERS

PROFESSOR RITTER Spring or Summer Terms, 3 credits

A brief study of the construction and operation of steam boilers, engines and turbines; and of gas engines and producers.

Two lectures and three laboratory hours per week. Junior year.

Pre-requisites: Mechanics 1; Physics 13.

4b. PRIME MOVERS

PROFESSOR RITTER — Fall Term, 5 credits

Similar to M.E. 4, with the addition of the Thermodynamics of Heat Engines. Designed with special reference to the needs of Electrical Engineering students.

Four lectures and three laboratory hours per week. Senior year.

Pre-requisites, Mechanics 1, Physics 15.

5. THERMODYNAMICS

PROFESSOR STEWART — Fall Term, 4 credits

A study of the general principles of energetics, the cycle, the thermal properties of matter, the steam engine cycle, the laws of gases, gas-engine cycles, refrigerating-machine cycles, and the thermal modifications of the theoretical cycle in actual steam and gas engines. The object of this course is to prepare the student for courses in steam-engine design, gas engines, compressed-air, refrigerating machinery, and motor cars.

Four lectures and recitations per week. Senior year.

Pre-requisites: Mathematics 10; Physics 15.

6. COMPRESSED-AIR MACHINERY

PROFESSOR RITTER — Winter Term, 2 credits

A study of the physical properties of air, its isothermal and adiabatic compression and expansion, single and multiple-stage compression, and the principal types of air compressors. Visits are made for the purpose of enabling the student to see the practical working of compressed air machinery.

Two lectures per week. Senior year.

Pre-requisites: M. E. 3 and 5.

7. MOTOR CARS

PROFESSOR STEWART. — Spring Term, 2 credits

This course covers a study of the construction, operation and design of modern motor cars as follows: (1) The power-plant, including gasoline motors, carburetor, ignition system, motor cooling and lubrication. (2) The transmission, including cone and multiple-disc clutches, speed-change and reverse gears, chain, bevel-gear and worm drives, differential, semi and full-floating axles, and brakes. (3) Front axles, steering mechanism, and control. (4) Frame, springs, and body. (5) Road wheels, quick detachable and demountable wheel-rims, and tires. (6) Care of car, road-rules, and how to drive. (7) Motor-trucks.

Frequent visits are made to garages and motor-car repair shops for the purpose of studying construction details and operation.

One lecture, and either three hours of drawing or laboratory per week. Senior year.

Pre-requisite: M. E. 3.

8. STEAM BOILERS

PROFESSOR STEWART — Winter Term, 2 credits

A study of the principal types of steam boilers, the design of the different structural details, the proportioning of a boiler of given type and horse-power, and the design of boiler accessories. Lectures on shop practice in boiler construction and visits of inspection to boiler and other plate metal shops. A study of fuels and furnaces used in the generation of steam, and of machinery for handling coal and ash.

One lecture and three drawing hours per week. Senior year.

Pre-requisite: M. E. 3.

9. STEAM ENGINES

PROFESSOR RITTER — Winter Term, 3 credits

A study of indicator cards, entropy-temperature and crank-effort diagrams for the best known types of simple and compound engines; also the design of engine details, such as crank shafts, crank pins, connecting rods, pistons, valve gears, governors, and fly-wheels. Lectures are given on shop practice in engine construction, and visits of inspection are made to study engines in process of construction and to steam power plants to study them while in operation.

One lecture and six drawing hours per week. Senior year.

Pre-requisites: M. E. 3 and 5.

10. STEAM TURBINES

PROFESSOR RITTER — Spring Term, 3 credits

A study of the theory of steam turbines and of the constructive details of the types most commonly in use for the generation of power. Visits of inspection are made to local plants to study turbines in the process of construction and in operation.

Three lectures and recitations per week. Senior year.

Pre-requisites: M. E. 3 and 5.

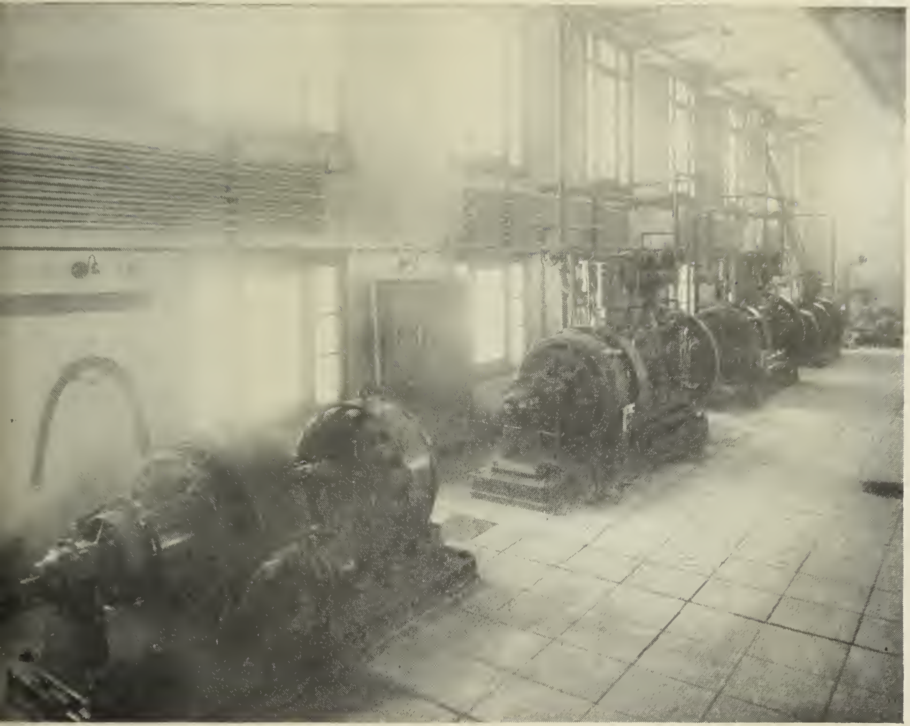
11. GAS ENGINES AND PRODUCERS

PROFESSOR STEWART — Winter Term, 3 credits

A study of modern gas engines and of the production of gas for motive power. A study is made of typical gas-engine details, after which the principal computations and drawings are made for a gas engine of given type and horse-power. Visits are made to see gas engines under process of construction and to see them operating.

Two recitations and lectures and three drawing hours per week. Senior year.

Pre-requisite: M. E. 3.



Power Laboratory

12. POWER-PLANT ENGINEERING

PROFESSOR RITTER Spring Term, 3 credits

A study of the selection and proportioning of the essential details of a power-plant. Lectures are given on location of plant, type of power house, foundations for engines and chimneys, and visits of inspection are made to a number of representative power-plants to enable the student to study their practical operation, and, when opportunity affords, visits are made to see power-plants in process of construction.

Two lectures and three drawing hours per week. Senior year.

Pre-requisites: M. E. 8, 9, 10, and 11; E. E. 5.

13. STEAM LABORATORY

PROFESSOR RITTER Winter Term, 2 credits

The testing and calibration of pressure and vacuum gauges, steam-engine indicators, planimeters, etc.; indicator and dynamometer power measurements, valve-setting, and determination of mechanical efficiency of engines; test of auxiliary apparatus, etc.

Six laboratory hours per week. Senior year.

Taken concurrently with M. E. 8 and 9.

14. POWER-PLANT TESTING

PROFESSOR RITTER Spring Term, 1 credit

Capacity and efficiency tests of steam and gas-engine power-plants, together with complete reports on same. These tests as far as practicable will be conducted upon recently constructed power plants. The time allotted to this course, while somewhat variable, will approximate the equivalent of three laboratory hours per week. Senior year.

Taken concurrently with M. E. 12.

15. MANUFACTURE AND PROPERTIES OF IRON AND STEEL

PROFESSOR STEWART Spring Term, 3 credits

A study of (1) the Bessemer process, the theory and construction of gas producers, the open-hearth or Siemens process, and the production of steel castings; (2) the mechanical treatment of steel, including a study of the five leading types of rolling-mills, and the three processes for the manufacture of steel tubes; (3) the heat treatment of steel. Visits of inspection, on which reports are required, are made to a number of the great steel and tube mills in the vicinity of Pittsburgh.

Two lectures and either three laboratory hours or one afternoon inspection trip per week. Senior year.

Pre-requisites: Chemistry 6 or 9; M. E. 4; E. E. 5.

16. INSPECTION VISITS AND REPORTS

PROFESSOR STEWART Fall and Spring Terms, I credit.

Visits of inspection are made to shops, mills, factories, and power plants.

The University, being located in a vast field of industrial activity, probably the most extensive of its kind in the world, affords the student a rare opportunity for studying practical engineering in all its varied forms. After each visit the class meets with the instructor for conference and discussion. The student then prepares and submits a report, which not only provides him with a record of useful data, but also gives him an excellent exercise in technical composition.

The equivalent of one afternoon each alternate week. Senior year.

17. CURRENT ENGINEERING TOPICS

PROFESSOR STEWART, PROFESSOR WEBER One credit each term

This course consists of the preparation of papers on current engineering topics of interest to the individual student and the presentation of same before the Junior and Senior Classes in Mechanical Engineering. The subject and manner of presentation are approved by a member of faculty before credits are granted.

Attendance required at joint meeting of Junior and Senior Classes in Mechanical Engineering one evening each alternate week.

18. THESIS

PROFESSOR STEWART

Winter and Spring Terms, 3 credits each term

The subject must be chosen and presented to the head of the department for approval during the latter part of the Fall term, Senior year.

This work will generally consist of the following: (1) the preparation of a bibliography of the important literature on the subject chosen; (2) the student's own investigations and deductions; and (3) the preparation of the thesis proper.

The thesis must be delivered in its final bound form to the head of the department not later than one week before date of Commencement.

Electrical Engineering

1. DIRECT CURRENTS, THEORY AND PRACTICE

PROFESSOR HARRIS Fall or Winter Terms, 5 credits

A study of the fundamental principles of electricity and magnetism and their application to direct-current machinery.

Five lectures and recitations per week. Junior year.

Pre-requisites: Physics 13.

2. APPLIED ELECTRICITY

MR. DYCHE AND ASSISTANT Fall or Winter Term, 3 credits

This is a short course designed to meet the requirements of those not specializing in Electrical Engineering.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

3. APPLIED ELECTRICITY

MR. DYCHE AND ASSISTANT Fall or Winter Term, 3 credits

This course is similar to E. E. 2; but more comprehensive in scope. Designed with special reference to the needs of Mechanical Engineering students.

Two lectures and recitations and three hours laboratory per week. Junior year.

Pre-requisites: Physics 13.

4. APPLIED ELECTRICITY

MR. DYCHE AND ASSISTANT Spring or Summer Term, 3 credits

A continuation of Course E. E. 3.

Two lectures and recitations and three hours laboratory per week. Junior year.

Prerequisite: E. E. 3.

5. APPLIED ELECTRICITY

MR. DYCHE AND ASSISTANT Fall Term, 3 credits

A continuation of Course E. E. 4.

Two lectures and recitations and three hours laboratory per week. Senior year.

Pre-requisite: E. E. 4.

6. ALTERNATING-CURRENT THEORY

PROFESSOR HARRIS Spring or Summer Term, 5 credits

This course consists of a mathematical and graphical treatment of periodic functions as exemplified in alternating currents with the attendant phenomena of inductance, capacity, etc., singly and in combination.

Five lectures and recitations per week.

Pre-requisites: E. E. 1.

7. ALTERNATING-CURRENT MACHINERY

PROFESSOR HARRIS Fall Term, 3 credits

A mathematical and graphical treatment of alternating-current phenomena as applied to electrical machinery. A study is made of the different types of generators, motors, synchronous converters, etc.

Three lectures and recitations per week.

Pre-requisite: E. E. 6.

8. ALTERNATING-CURRENT MACHINERY
PROFESSOR HARRIS Winter Term, 3 credits

A continuation of Course E. E. 7.

Three lectures and recitations per week. Senior year.

9. ALTERNATING-CURRENT MACHINERY
PROFESSOR HARRIS Spring Term, 3 credits

A continuation of Course E. E. 8.

Three lectures and recitations per week. Senior year.

10. GENERAL ELECTRICAL ENGINEERING
MR. DYCHE Fall Term, 3 credits

This course is designed to cover the engineering and economic phases of the more special branches of Electrical Engineering, such as Electric traction, electric transmission of power, etc.

Three lectures and recitations per week. Senior year.

Pre-requisite: E. E. 6.

11. GENERAL ELECTRICAL ENGINEERING
MR. DYCHE Winter Term, 3 credits

A continuation of Course E. E. 10.

Three lectures and recitations per week. Senior year.

12. GENERAL ELECTRICAL ENGINEERING
MR. DYCHE Spring Term, 3 credits

A continuation of Course E. E. 11.

Three lectures and recitations per week. Senior year.

13. ELECTRICAL ENGINEERING DESIGN
MR. DYCHE Fall Term, 2 credits

This course is intended to give the student practice in the application of the fundamental theory of electricity and magnetism to the calculation and proportioning of electrical machinery. A portion of the time is devoted to the study of the materials entering into electrical construction.

Six hours of design per week. Senior year.

Pre-requisite: E. E. 1.

14. ELECTRICAL ENGINEERING DESIGN
MR. DYCHE Winter Term, 2 credits

A continuation of Course E. E. 13.

14a. ELECTRICAL ENGINEERING DESIGN
MR. DYCHE Spring Term, 2 credits

A continuation of Course E. E. 14.

15. ELECTRICAL ENGINEERING LABORATORY
PROFESSOR HARRIS AND ASSISTANT Fall or Winter Term, 2 credits

This course is designed to furnish an experimental basis for the theory given in Course E. E. 1. It consists largely of elementary direct current machine tests.

One hour lecture and three hours laboratory per week. Junior year.
Taken concurrently with E. E. 1.

16. ELECTRICAL ENGINEERING LABORATORY
PROFESSOR HARRIS Spring or Summer Terms, 2 credits

An experimental study of alternating current circuits, supplementing Course E. E., 6; with special reference to the effect of inductance and capacity, singly or in combinations. The measurement of alternating current single and polyphase power, and the determination and analysis of wave forms constitutes a portion of the work.

One hour lecture and three hours laboratory per week. Junior year.
Taken concurrently with E. E. 6.

17. ELECTRICAL ENGINEERING LABORATORY
PROFESSOR HARRIS AND ASSISTANT Fall Term, 2 credits

Advanced direct and alternating current testing of generators, motors, transformers, converters, rectifiers, etc., both commercial and for the purpose of investigation.

Six hours laboratory per week. Senior year.
Taken concurrently with E. E. 7.

18. ELECTRICAL ENGINEERING LABORATORY
PROFESSOR HARRIS AND ASSISTANT Winter Term, 2 credits

A continuation of Course E. E. 17.
Six hours laboratory per week. Senior year.

19. ELECTRICAL ENGINEERING LABORATORY
PROFESSOR HARRIS AND ASSISTANT Spring Term, 2 credits

A continuation of Course E. E. 18.
Six hours laboratory per week. Senior year.

20. A. I. E. E. STUDENT BRANCH
Three Terms, 1 credit each term

This course is covered by the work of the recently organized, University of Pittsburgh Student Branch of the American Institute of Electrical Engineers. Regular meetings of the Student Branch are held at the University once each month, when original papers or the regular proceedings of the Institute are read and discussed by the students. In addition to these regular meetings the attendance of the student is required at the regular monthly meeting of the local Pittsburgh Branch American Institute of Electrical Engineers. Open to all students in Electrical Engineering.

21. INSPECTION VISITS AND REPORTS Three Terms, one credit each term

Frequent visits of inspection are made to the numerous manufacturing establishments, both electrical and mechanical, in this vicinity. The University is unusually fortunate in being located in this great manufacturing center, where the student sees the principles which he studies in the department daily put into practical operation. Among the many large electrical establishments accessible to the technical students, especial benefit is derived from the great Westinghouse works, to which the classes are welcome visitors at any time.

Required of all Seniors in Electrical Engineering.

22. ELECTRICAL ENGINEERING THESIS 2 credits

A thesis is required of all candidates for the degree of B. S. in Electrical Engineering. This will consist of a report on original investigations and is intended to demonstrate the student's ability to think and act along independent lines. The subject must be approved by the professor in charge by January 15th, prior to Commencement and an outline of the results desired and method to be employed approved not later than April 1st.

23. ELECTRICAL ENGINEERING PROBLEMS
MR. DYCHE Spring or Summer term, 2 credits

A course in the solution of practical Electrical Engineering Problems. Special emphasis is placed on the analysis of data and the solution from fundamental laws and principles without reference to special formulas.

Two recitations per week. Junior year.

Pre-requisite, E. E. 1. Taken concurrently with E. E. 6.

24, 25, 26. Practical Applications
PROFESSOR LINCOLN Fall, Winter, and Spring, 2 credits

This course will consist in the solution of a selected list of problems involving the application of the theory in Electrical Engineering to Engineering practice.

Two recitations per week. Senior year.

Pre-requisites: E. E. 6, and Mech. 2.

Sanitary Engineering

1. HYDRAULICS
PROFESSOR CASE Spring or Summer Term, 5 credits

The equilibrium and pressure of liquids; the motion and work of fluids; the flow of water through orifices, over weirs, in pipes, and in canals; measurement of water power; and hydraulic machinery.

Five recitations and lectures per week. Junior year.

Pre-requisites: Mechanics 1, Mathematics 10.

2. HYDRAULIC LABORATORY

PROFESSOR CASE Spring or Summer Term, 1 credit

The experimental study of the flow of water through pipes, nozzles, and orifices over weirs, and in streams. Capacity and efficiency tests of hydraulic turbine pumps and motors.

Three laboratory hours per week. Junior year.

Taken concurrently with S. E. 1.

3. WATER EXAMINATION

PROFESSOR PHILLIPS Spring or Summer Term, 3 credits

See outline of course under Chemistry.

One lecture and six laboratory hours per week. Junior year.

Pre-requisites: Chemistry 21, 22, 23.

4. LABORATORY METHODS

PROFESSOR WALLGREN Fall Term, 2 credits

See outline of course under Biology 20.

Taken concurrently with advanced Bacteriology. Senior year.

5. HEATING AND VENTILATION

PROFESSOR CASE Winter Term, 2 credits

A series of lectures dealing with the various systems and the fundamental mechanical principles involved in their application and design. Senior year.

6. SANITATION OF BUILDINGS

PROFESSOR WALLGREN Winter Term, 2 credits

See outline of course under Biology 22.

Taken concurrently with S. E. 5. Senior year.

7. WATER SUPPLY ENGINEERING

PROFESSOR CASE Winter Term, 2 credits

The subject of municipal supply is taken up, dealing with the quantity required and the source of supply, the design of stand pipes, reservoirs, conduits, and distributing systems, with the study of sedimentation and filtration works for improving the quality of the water. Visits of inspection to various plants in the vicinity are made during the term.

One lecture and three hours designing per week. Senior year.

Pre-requisites: Mechanics 2, S. E. 1.

8. SEWERAGE AND SEWAGE DISPOSAL ENGINEERING

PROFESSOR CASE Spring Term, 3 credits

The drainage of lands, the sewerage of cities and towns, the laws governing the disposal of sewage, and a study of the various systems of sewage treatment.

One lecture and six hours designing per week. Senior year.

Pre-requisites: Mechanics 2, S. E. 1.

9. MUNICIPAL SANITATION

DR. WALLGREN Spring Term, 3 credits

See outline of course under Biology 23.

One lecture and four laboratory hours per week. Senior year.

Taken concurrently with S. E. 7 and 8.

10. HYDRAULIC AND SANITARY ENGINEERING DESIGN

PROFESSOR CASE Winter Term, 4 credits

The design of structures connected with sanitary engineering, the development of water power, and irrigation projects, and supplementing course S. E. 7.

Two lecture or recitation and six hours designing per week. Senior year.

Pre-requisites: S. E. 1, S. E. 3, C. E. 8.

11. HYDRAULIC AND SANITARY ENGINEERING DESIGN

PROFESSOR CASE Spring Term, 2 credits

A continuation of course S. E. 7.

One lecture or recitation and three hours designing per week.

12. CURRENT TOPICS

PROFESSOR CASE 1 credit per term

Prepared presentation and discussion of various engineering and scientific problems of the day, particularly those pertaining to the public health.

One hour per week. Junior and Senior years.

13. VISITS OF INSPECTION

PROFESSOR CASE

Visits to various industrial plants, sanitary works, and engineering projects under construction. Reports covering each visit in detail are required.

One afternoon of each alternate week. Senior year.

14. SANITARY ENGINEERING PRACTICE

PROFESSOR KNOWLES OR PRACTICING ENGINEERS

Fall, Winter and Spring Terms, 1 credit each

Discussion of the various aspects of current day sanitary problems as they present themselves to the practical engineer. Accompanied by assigned readings and reports.

One hour per week. Senior year, 3 terms.

15. THESIS

PROFESSOR KNOWLES AND PROFESSOR CASE

Winter and Spring Terms, total 7 credits

All candidates for the degree of B. S. in S. E. must prepare a thesis embodying a large amount of original design or research in some branch of their profession.

THE DEPARTMENT OF CHEMICAL ENGINEERING.

Broadly stated, the object of the course in Chemical Engineering is to give the student a good broad foundation knowledge of chemistry, to give him the point of view of the engineer, the engineer's regard for precision, yields and costs and the engineer's knowledge of materials of construction. It is not to be expected that after his four years' training, the graduated chemical engineer will have absorbed the training of a mechanical engineer, an electrical engineer and a chemist. It is generally recognized, however, that the old-fashioned academic training in chemistry left much to be desired from the standpoint of the manufacturing chemist, as well as other industrialists confronted with problems of a chemical engineering character.

The kind of chemical training, very properly called Chemical Engineering, has been evolved in response to an industrial need. Through the united forces of the Mellon Institute of Industrial Research, the Department of Chemistry and the several Departments in the School of Engineering of the University, and by reason of the location of the University in a great industrial center, the University of Pittsburgh is peculiarly fitted for giving such training.

It should be mentioned, in this connection, that much of the special instruction in chemistry is given by Research Fellows in the Mellon Institute of Industrial Research, who are specialists in their respective fields. Students are made to feel the *life* of the science. Contact with research is bound to have this result.

The chemical library of the Mellon Institute and the Technology Department of the Carnegie Library of Pittsburgh are available to students of chemical engineering. The equipment of the Mellon Institute is employed by the students in their laboratory work in industrial chemistry. This equipment includes large apparatus specially constructed for carrying out the typical operations of the manufacturing chemist on a reduced scale. Students are required to inspect a number of chemical plants with their instructor. Further information is contained in a Bulletin issued by the Department of Chemical Engineering, June, 1914, which may be had on application to the Secretary of the University.

Mechanical Railway Engineering

1. MATERIALS OF RAILWAY ENGINEERING
MR.——— Fall or Winter Terms, 2 credits

A study of the properties of materials used in the construction of locomotives, cars, shops, and power plants of railways.

One recitation and three drawing periods per week. Junior year.

2. OPERATING UNITS
MR.——— Spring or Summer Term. 6 credits

a. Locomotives—The principles involved in the design and operation of steam locomotives, the determination of power, type, and design to meet various operating conditions. Advantage of compounding, super-heating, etc.

b. Passenger Cars—The principles involved in the design and operation, type and construction of the vehicle, including trucks, brakes, etc.

c. Freight Cars—The general design and construction of the vehicle, including trucks, draft gears, required appliances for operation and use.

3. RAILWAY DESIGN
MR.——— Fall Term, 7 credits

a. Locomotive—The design of locomotives of various types, including boiler and appurtenances, engine, brakes and other required appliances.

b. Passenger Car Design. The principles involved in the design and construction of passenger cars covering the details of the vehicle, trucks, and other required appliances.

c. Freight Car Design—The principles involved in the design and construction of freight cars covering the details of the vehicle, trucks and other required appliances, including a study of standards of the M. C. B.

4. UTILIZATION OF LOCOMOTIVES AND CARS
MR.——— Winter Term. 3 credits

a. Locomotives—A study of the Economic limits of speed and load, rating, train resistance, running and firing, stokers, dynamometer trials, etc.

b. Cars—Repair limits, resistance, inspection, running repairs, etc.

5. MAINTENANCE OF LOCOMOTIVES AND CARS
MR.——— Spring Term. 4 credits

a. Locomotives—Economic limits of wear, proper maintenance of locomotives so that they will perform their work successfully at a reasonable cost. The organization, and arrangement of shop equipment, shop methods, repair of locomotive details and manufacture of material therefor. The receipt and shipment of material, accounting, including stock. consumption and requisitions. The inspection, reclamation and disposition of scrap. The maintenance of power in service, effects of various water, fuels and lubrication maintenance.

b. Passenger Cars—Organization, equipment, maintenance, and arrangement of the shop, shop methods, repair and manufacture of passenger car materials. Inspection and maintenance of cars in service.

c. Freight Cars—Organization, equipment and arrangement of equipment of shops including shop methods, repairs and manufacture of details, interchange, inspection, loading, running repairs and attention.

6. RAILWAY SHOP METHODS ..
MR.———————— Spring Term. 2 credits

Method of receiving and distributing the work, routing, handling material, special tools, tool room practice, etc.

7. FUNDAMENTALS OF RAILWAY PRACTICE
MR. D. F. CRAWFORD Senior Year. 1 credit

Discussion of the various aspects of current day practice as they should present themselves to the Superintendent of Motive Power.

8. CURRENT TOPICS
MR. ———————— 1 credit per term

Prepared presentation and discussion of the various engineering problems of Mechanical Railway Engineering by the students. Discussion by the instructors.

One hour per week. Junior and Senior years.

9. THESIS
MR. CRAWFORD Winter and Spring Terms. 7 credits

All candidates for a degree must prepare a thesis embodying original design or research in some branch of this profession.

Senior year.

Economics

3 E. ECONOMICS
Fall or Winter Term, 3 credits

A brief resumé of economic theory. Discussion of practical economic problems; wages, interest, rent, currency, banking, taxation, trusts, tariff, socialism.

Open only to Engineering and special students.

Text-book and lectures.

10, 11. TRANSPORTATION

Fall and Winter Terms; 2 credits each term

The origin and growth of the American railways. Their present ownership and control. The organization of the railway company, and how it does its work. Railway financiering. The freight, passenger, express and mail service. Railway abuses. Regulation by the States and by the Federal Government. The Interstate Commerce Commission. Government ownership in the light of foreign experience. Railway rates and fares. Electric railway transportation. Ocean transportation. Ocean highways and seaboard terminals. The organization of ocean freight, passenger, express and mail service. The merchant marine. The question of subsidies. The river, lake and canal systems of the United States. The increasing importance of the inland waterways question. Text-book, lectures and assigned readings. Text-book, Johnston's *Elements of Transportation.*

13. MODERN INDUSTRIES

Fall Term; 2 credits

A study of the leading American industries, physiographic control, sources and supply of raw material, agricultural resources. Factors affecting the location of industry. Sources and application of power. Manufacturing methods, and factors affecting cost of production. Large scale versus small scale production. Internal commerce and foreign trade. Lectures, assigned readings and reports.

16. INDUSTRIAL MANAGEMENT

Winter Term; 2 credits

Advantages of various methods of business organizations and management. The internal management of the large business or plant and the differentiation of the duties of various departments. Profit-sharing schemes. Labor problems. Markets and methods of distribution. A study of actual industrial conditions by visits to the mills and shops of Pittsburgh, special attention being given to the handling of raw material, the arrangement of plant, and shipping facilities. Lectures, assigned readings reports, field work.

21. CORPORATION FINANCE

PROFESSOR HOLDSWORTH — Fall Term; 2 credits

Types of business corporations. The genesis of the trust. The financial organization and management of the corporations. The promoter and the underwriting syndicate. The disposition of gross earnings and the provision of new capital. Charter, articles and by-laws. Stockholders' powers, rights and liabilities. Dissolution, receiverships and reorganizations. Lectures and text-book, assigned readings and reports. Text-books, Lough's *Corporation Finance.*

24. Investments

Professor Holdsworth. Winter Term; 2 credits

The general characteristics and merits of government and municipal bonds, and of railway, industrial, public service corporation, power and irrigation securities. The farm and city mortgage. How securities are purchased and marketed. The organization of the investment business. A study of fluctuations in bond and stock prices to determine the influence acting upon security values. Analysis of typical securities and railroad reports. Examination of savings banks and trust company holdings. Lectures assigned readings, and reports.

32. Public Finance

Professor Holdsworth Winter Term; 2 credits

Federal taxation and expenditures. Budget systems of other countries. The justice and incidence of taxation. State and municipal taxation and expenditures. General property tax, income and inheritance taxes, the single tax, methods of assessment. City budgets and municipal accounting. A study of the fiscal and monetary history of the United States. Lectures and reports.

46. Contracts and Specifications

Mr. Brown Spring Term; 3 credits

In this course are presented the essential elements of a contract, the law pertaining thereto and parties who may contract. The consideration, discharge and remedies for breach of contract. Forms of proposals, specifications and illustrative examples of complete contracts and specification for various engineering projects are given.

Mathematics

5. Plane Trignometry

Professor Holder, Mr. Albert, Mr. Foraker and Mr. Weber

The subjects treated are the functions of angles, goniometry, trigonometric equations, solution of right and oblique triangles, with emphasis upon solution of examples of all kinds, involving both theory and practical applications.

Freshman year.

6, 7, 8, 9, 10.

Professor Holder, Mr. Albert, Mr. Foraker and Mr. Weber

Freshman Year, { Fall Term; 2 credits
Winter Term, 5 credits
Spring Term; 5 credits
Sophomore Year, { Summer or Fall Term; 5 credits
Winter or Spring Term; 4 credits

This is a course in Mathematics for students in Engineering and applied science as presented in Woods & Bailey's text.

Advanced Algebra, Analytical Geometry, Differential and Integral Calculus are combined in this one treatise.

The course extends throughout the Freshman year, and terminates at the end of the second term of the Sophomore year

Physics

11, 12, 13. General Physics

Professor Bishop and Mr. Ulrey

Fall, Winter, Spring and Summer Terms, 5 credits each term

The subjects covered in this course are the same as those in 1, 2, 3, but the calculus is extensively employed and special attention is given to the physical interpretation of mathematical equations.

A series of twelve lectures on the precision of measurements is given in connection with the laboratory work. Special attention is given in the laboratory to the method of the experiment and to the precision of the results.

Concurrent with Mathematics 9 and 10.

Required of all Engineering students. Sophomore year.

14, 15, 16. Advanced Physical Laboratory

Dr. Wenrich Fall, Winter, Spring and Summer Terms

This course deals primarily with electric measurements but includes experiments in measurement of high temperature, calorific power of fuels, and photometry. The experiments for each student are assigned according to the course he is pursuing.

Pre-requisite, Physics 11, 12, 13.

30, 31. Mathematical Theory of Electricity and Magnetism

Dr. Wenrich Winter and Spring Terms, 3 credits each term

A rigid Mathematical treatment of electricity and magnetism, including a study of Hertz's experiments and the present day theory of electromagnetism. Senior year.

Three lectures and recitations per week.

Pre-requisites, Mathematics 13.

CHEMISTRY .

1, 2, 3. General Inorganic Chemistry

Professor Silverman and Messrs. Weirich, O'Callahan, Hess, Vawter, Blake, Padgett, Humphrey, Rose, Bishop, Ballantyne and Elledge.

Fall, Winter, and Spring Terms, 4 credits each

A study of the metals and non-metals, principles, theories and calculations. Visits are made to a considerable number of manufacturing establishments so that the student may see practical applications of chemical principles. Two lectures are given weekly. Six hours are scheduled for laboratory practice of which one hour is devoted to recitation.

20, 21, 22. QUALITATIVE AND QUANTITATIVE ANALYSIS
DR. NEIDLE, PROFESSORS UHLINGER AND RUPERT
Fall, Winter, and Spring Terms, 4 credits each

A study of qualitative tests applied in detection of the more common elements and compounds followed by methods for separation of the various elements from each other. On completion of this work, the student is given instruction and practice in the exact or quantitative determination of some of the above elements by both gravimetric and volumetric methods. Modern ideas in Inorganic and Physical are applied. One lecture, one recitation and two three-hour laboratory periods per week. Prerequisites:

—1, 2, 3.

31. TECHNICAL GAS ANALYSIS
PROFESSOR PHILLIPS Spring Term, 3 credits

Brief practical course for Engineers and Miners including instruction in sampling, use of Orsat (portable) apparatus and others which permit of rapid analysis. One lecture and two three-hour laboratory periods per week. Prerequisites:—20, 21, 22.

40, 41, 42. ORGANIC CHEMISTRY

PROFESSORS HITCH, NICOLET AND PERKINS
Fall, Winter, and Spring Terms, 4 credits each

An introduction to the chemistry of the compounds of carbon. The student is given an opportunity to prepare a large number of typical carbon compounds and study their properties, reactions, and uses. Two lectures and two-three-hour laboratory periods per week. Prerequisites:—1, 2, 3. 20, 21, 22.

43. 44. 45. ORGANIC CHEMISTRY
PROFESSOR HITCH Fall, Winter, and Spring Terms, 2 credits each

A more advanced course, intended to prepare the student for research in the field of organic chemistry. Pre-requisites:—40, 41, 42.

50, 51, 52. PHYSICAL CHEMISTRY
DR. NEIDLE Fall, Winter, and Spring Terms, 3 credits each

A study of the laws governing chemical phenomena. The Spring term is devoted to a consideration of the theoretical principles and some practical applications of electro-chemistry. Two lectures and one three-hour laboratory period. Prerequisites:—Chem. 20, 21, 22, and Math. 6, 7, 8, 9, 10.

53. 54. 55. ADVANCED PHYSICAL CHEMISTRY
DR. NEIDLE Fall, Winter, and Spring Terms, 3 credits each

In this course thermodynamics and recent advances in physical chemistry are studied. Prerequisites:—50, 51, 52.

89. WATER EXAMINATION, TREATMENT AND PURIFICATION
PROFESSORS BUSHONG AND LIDDLE AND MR. GODFREY
Spring Term, 4 credits

Brief course for Sanitary Engineers. Two lectures and two three-hour laboratory periods per week. Prerequisites:—Courses 20, 21, 22, 40, 41.

100, 101, 102. INDUSTRIAL CHEMISTRY
PROFESSOR SHUEY Fall, Winter, and Spring Terms, 2 credits each

Lectures upon the chemistry of manufacturing operations, having reference especially to chemical industries in the Pittsburgh region. Visits are made to the various chemical works in the vicinity, attendance on which is required. Prerequisites: Courses 1, 2, 3; 20, 21, 22; 40, 41, 42.

101b, 102b. INDUSTRIAL CHEMISTRY (LABORATORY)
PROFESSOR BROOKS AND MR. RHODES
Winter and Spring Terms, 3 credits each

A nine hour laboratory course given in the Mellon Institute of Industrial Research affording the student practice in large scale experimenting. This course should accompany Chemistry 101 and 102.

Biological Sciences

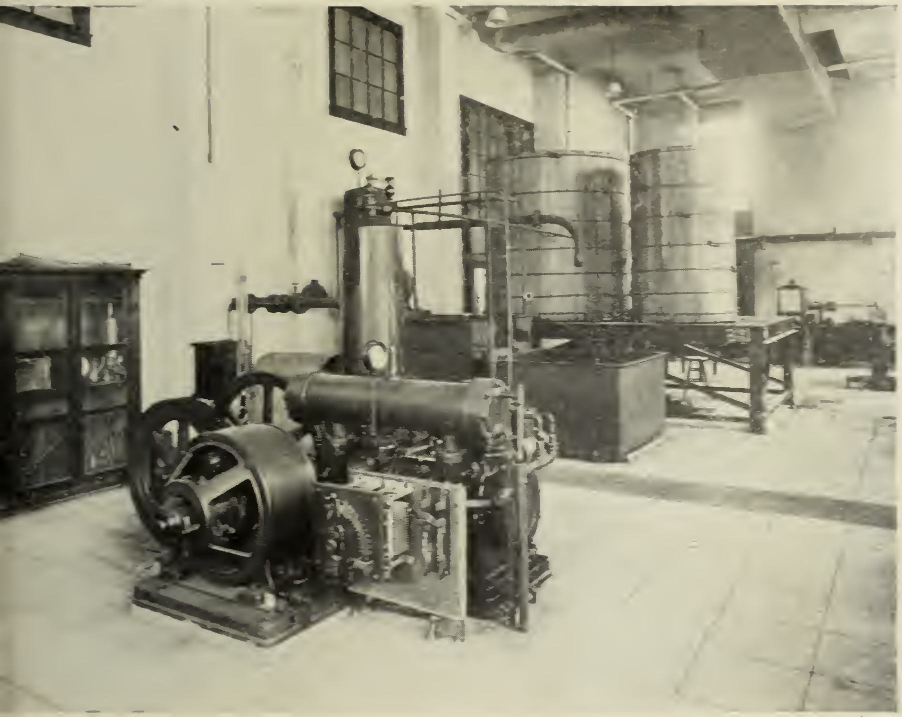
3. GENERAL BIOLOGY.
PROFESSOR FETTERMANN AND ASSISTANT
Spring or Summer Terms, 3 credits

This course is designed to meet the needs of engineering students. During the first half of the course attention is given to the study of animal forms, including classification, distribution, habits, etc. The remainder of the term is given to the study of the morphology, classification and distribution of plants.

One lecture and four laboratory hours each week.

17, 18. BACTERIOLOGY
PROFESSOR FETTERMAN Fall and Winter Terms, 4 credits each term

This course is intended for students taking regular courses in Biology, and also those who may elect the work in Sanitary Engineering. Students are expected to become familiar with the methods of detection, isolation,



Compressed Air and Hydraulics

and identification of various micro-organisms. Lectures are given on acteristics of bacteria. Instruction is given on the principles of steriliza- the classification, morphology, structure, reproduction and cultural char- tion and disinfection, special emphasis being laid upon their practical application. In the latter part of the course special attention is given to the study of the bacteria occurring in soil, water and milk. The manner in which bacteria produce disease and the production of immunity are explained. Text-books: Jordan, Abbott, Muir, and Ritchie.

One lecture and six hours laboratory each week.

19. ADVANCED BACTERIOLOGY

PROFESSOR FETTERMAN Spring Term, 4 credits

One lecture and six hours laboratory each week.

This course is the continuation of Course 18. The object is to impart a practical knowledge of the bacteriology of water, milk and sewage. Bacteria are studied in their relation to the dairy industry, and water supply, and also with reference to the part they play in the purification of sewage.

21. PERSONAL HYGIENE

PROFESSOR WALLGREN Fall Term, 2 credits

Lectures with the purpose of bringing out a general but accurate idea of the care and the operation of the human organism. They will touch on Anatomy, with a discussion of functions of the various systems, emphasizing effects of muscular fatigue and bad air upon the body, also the right use of body and methods of maintaining proper efficiency through choice of foods, recreation, rest, sleep, exercise, clothing and bathing.

PSYCHOLOGY AND PHILOSOPHY

4. GENERAL PSYCHOLOGY FOR TECHNICAL STUDENTS

PROFESSOR WHITE One Term; 3 credits

This is an introduction to the study of human nature and the psychical forces behind material progress. Emphasis will be placed upon such problems as individual differences of character and intelligence, their causes and significance; the fundamental instincts, imitation, competition, co-operation; the many social relationships, suggestion, habit, memory, constructive imagination, the emotions, reason, will, etc.

Required of all students in the School of Engineering.

4. PRINCIPLES OF PHILOSOPHY

PROFESSOR WHITE Winter or Spring Term; 2 credits

Fundamental principles of philosophy, stages in their development, and present day applications.

GEOLOGY

1. General Geology

Professor Johnson Fall Term; 3 credits

The general principles of geology exclusive of historical, structural and field geology. The probable origin and structure of the earth, volcanic and earthquake activities, destructive and constructive work of air and water, etc.

3. Structural and Field Geology

Spring Term, 3 credits

This course is an effort to apply the general principles of geology in teaching the student how to interpret for himself the geologic significance of earth features and structure.

General Mineralogy

1. Mineralogy

Mr. Leighton Spring or Summer Term; 2 credits each term

Designed primarily for Engineering students but open to anyone desiring a brief course in the subject. About 75 minerals and 20 rock types are studied. Special emphasis being made upon the identification and practical uses to the engineer.

Astronomy

1. General Astronomy

Assistant Professor Jordan Spring or Summer Term; 3 credits

A course in Descriptive Astronomy, based upon Moulton's text-book. Required in C. E. Course. Junior year.

METALLURGY.

1, 2, 3. General Introductory Course

Professor Goodale Fall, Winter, and Spring Terms, 5 credits each term

A general study of the manufacture and properties of the common metals. Three recitations or lectures and six hours laboratory work are required each week. Text-book for fall and winter, Austin's Metallurgy of the Common Metals; for spring, Stoughton's Metallurgy of Iron and Steel. Required of all students in the School of Mines.

19, 20, 21. ELECTRO-METALLURGY

PROFESSOR GOODALE Fall, Winter, and Spring Terms, 5 credits each term

A careful study of the electrothermic and electrolytic processes applied to the recovery and refining of metals. Text-book, Thompson's Applied Electro-Chemistry. Three recitations and 6 hours laboratory work per week. Elective. The course is advanced work and requires a knowledge of chemistry, elementary electricity and metallurgy. This course takes up some of the most interesting and promising phases of metallurgy.

English Language and Literature

4 and 5. ENGLISH COMPOSITION

DR. SNOW Fall and Winter Terms, 4 credits

A study of the principles of composition, written and oral, with especial reference to exposition. Practice in writing and speaking; analysis of specimens of technical and scientific exposition.

Text-book: Earle's *Technical Writing.*

Required of Freshmen in the School of Engineering.

6. ENGLISH COMPOSITION

DR. SNOW Spring Term; 3 credits

A continuation of courses 3 and 4, the practice in oral composition being discontinued.

Three hours a week.

Required of Freshmen in the School of Engineering.

7. ARGUMENTATION AND DEBATING

PROFESSOR GIBBS AND MR. MILLER Summer or Fall Terms, 3 credits

The theory of argumentation, with practical exercises in brief-drawing and the composition and delivery of forensics.

Elective for students who have taken Courses 1, 2, 3 or 4, 5, 6. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15.)

15. ENGLISH LITERATURE

PROFESSOR GIBBS Summer or Fall Term, 3 credits

A study of selected masterpieces representing the successive periods of English literature, with a text-book to furnish a historical background and connections.

Required of Sophomores. (Sophomores in the School of Engineering are allowed an option between Courses 7 and 15. For their benefit both courses will be offered in the Fall and Summer terms.)

German Language and Literature

1, 2, 3. ELEMENTARY GERMAN
PROFESSOR BERGER Fall, Winter and Spring Terms, 3 credits each term

Elements of grammar and the reading of easy texts. Vos, *Essentials of German;* Hewitt's *German Reader;* Simple lyrics and ballads memorized. Gerstaecker, *Germeythausen;* Baumbach, *Der Schwiegersohn.*

Open to Freshmen who have satisfied requirements for admission by offering French or Latin if they wish to take up German as the required modern language. Elective for Sophomores.

4, 5, 6. INTERMEDIATE COURSE
PROFESSOR BERGER Fall, Winter and Spring Terms, 3 credits each term

Review of Grammar. Drill in translating from English into German and practice in conversation. Memorizing of simple prose and poetry. Wesselhoeft: *German Exercises.* Wenckebach: *German Composition.* Wildenbruch: *Das edle Blut.* Gerstæcker: *Irrfahrten.* Hatfield: *German Lyrics and Ballads.*

Classical German Authors. Selections from the following lists of texts: Schiller: *Maria Stuart.* Gœthe: *Hermann und Dorothea;* Lessing: *Minna von Barnhelm.* German is used extensively in conducting class work.

Required of all Freshmen satisfying entrance requirements in German who elect to continue it.

30, 31, 32. ELEMENTARY SPANISH
DR. BOYCE Fall, Winter and Spring Terms, 3 credits each term

Hill's and Ford's Spanish Grammar, reading, composition, conversation. Bransby's *Spanish Reader;* Selga's *La Mariposa Blanca;* Galdo's *Dona Perfecta; Tamayo Lo Positivo;* Giese's *Spanish Anecdotes.*

35, 36, 37. COMMERCIAL SPANISH
DR. BOYCE Fall, Winter and Spring Terms, 3 credits each term

Reading of Commercial Spanish. Commercial correspondence. Conversation. The vocabulary of every day life is emphasized.

40, 41, 42. ELEMENTARY ITALIAN
MR. PIERRUCCI Fall, Winter and Spring Terms, 3 credits each term

Elementary grammar, dictation, reading, memorizing, conversation, and easy composition. Motti's Elementary Italian Grammar. Cattaneo, Italian Reader. DeAmicis, Cuore. Other selections from modern authors will be assigned by the instructor.

43, 44, 45. ITALIAN, INTERMEDIATE COURSE
MR. PIERRUCCI Fall, Winter and Spring Terms, 3 credits each term

Study of Italian Grammar in Italian. Conversation and advanced prose composition. Italian literature of the XVIII and XIX centuries. Selected readings and brief lectures in Italian. Manzoni, I Promessi Sposi, will be read in full.

Open to students who have taken the course in Elementary Italian.

SPECIAL LECTURES AND LECTURERS.

One of the important features of the work in the School of Engineering is the number of special lectures which we are able to secure, due to our location in the industrial center. The students in the School of Engineering as a body meet once a week to listen to discussions of topics of general interest to engineers. Among those who have lectured during the past year are the following:

"Electricity in the Home", Wm. A. Easton, Westinghouse Electric & Manufacturing Company.

Mr. S. P. Grace, General Superintendent, Bell Telephone Company. Illustrated.

"Cement", T. H. Bates, U. S. Government.

"Power Troubles", J. W. Welsh, E.E., Pittsburgh Railways Company.

"Sunken Bell", "Gerhart Hauptman's", Rudolph Tombo, Jr., Assistant Professor of Germanic Languages and Literature at Columbia University.

"Signal Systems", L. F. Howard, C.E., Union Switch & Signal Company.

"Power Troubles", Joe W. Welsh, E.E., Pittsburgh Railways Company.

"Some Things an Engineer Ought Not To Do", George H. Neilson, Secretary and General Manager for the Braeburn Steel Company.

"Cork Industry", H. W. Prentis, Armstrong Cork Company.

Mr. Charles M. Bregg, Dramatic Critic for Gazette Times.

"Heat Insulation", H. W. Prentis, Armstrong Cork Company.

"Vacuum System of Steam Heating", James A. Donnally, C.E., New York.

"The Diesel Engine", A. F. Nesbit.

"Recent Bridges", F. J. Affelder, Sales Manager, American Bridge Company, Pittsburgh, Penna.

J. M. Searles, City Smoke Inspector.

"Motor Applications", D. S. Bowman, Commercial Engineer, Westinghouse Electric & Manufacturing Company.

"Price Making", R. Seybold, Westinghouse Electric & Manufacturing Company.

"Development of Industrial Control", Paul Caldwell, General Electric Company.

"Yucatan", Henry Hornbostle, Ph.B., Special Lecturer on Architecture.

ALUMNI REGISTER
OF THE
SCHOOL OF ENGINEERING
OF THE
UNIVERSITY OF PITTSBURGH

ENGINEERING ALUMNI REGISTER

This Register contains a complete list of all graduates of the University who took a degree in engineering, except in the School of Mines.

The addresses and occupations have been corrected in accordance with information furnished up to February 1st, 1912.

The Dean has been assisted in the preparation of this Register by Emeritus Professor Carhart, Professors Frost, Stewart and Smith.

OPPORTUNITIES FOR APPOINTMENTS

The School of Engineering receives inquiries from time to time for men to fill positions in engineering work. These positions are often for graduates who have had a few years' experience, and many times we are unable to fill them owing to the fact that we do not have the addresses of all the graduates, some of whom may wish to consider such positions.

If you employ engineers, and at any time have a demand for men of experience, or for undergraduates without experience, we should be glad to have you communicate with the Dean of the School of Engineering.

ABBREVIATIONS

*Deceased.
C. E. Civil Engineer.
M. E. Mechanical Engineer.
E. E. Electrical Engineer.
Ch. E. Chemical Engineer.
S. E. Sanitary Engineer.
Eng. Student for a time in engineering.

1846

*Morley, Isaac, C. E.
*Stilley, Edward J., C. E.

1858

*Marshall, Thomas F., C. E.

1870

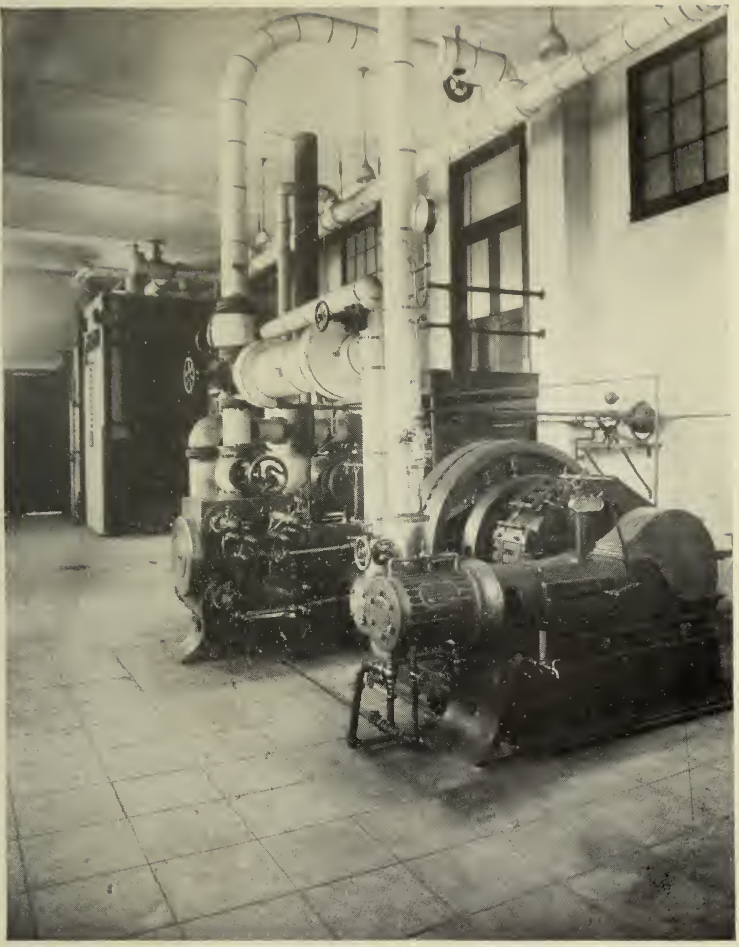
Reed, James, C. E.

1873

*Hartupee, William Dilworth, M. E.

1874

Smith, William R., Eng.
*Stewart, Charles A., Eng.



100 Horse Power Experimenting Steam Unit

1875

Neeld, Almos D., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.
Trimble, Robert, Eng., Chief Engineer, Maintenance of Ways, Pennsylvania Co., Union Station, Pittsburgh, Pa.

1876

McCullough, Ross, C. E.

1877

*Canfield, Morris Pierpont, C. E.

1878

Jordao, Francisco Rodigues, C. E., San Paulo, Brazil.
Sickman, Albert F., C. E., Hydraulic Engineer, Holyoke Water Power Co., Holyoke, Mass.

1879

Gilfillan, Alexander, C. E.
Keller, Charles, C. E., Retired, 117 Biddle Ave., Wilkinsburg, Pa.
Swan, Robert, C. E., Director of Department Public Works, Pittsburgh, Pa.

1880

Camp, James McI., C. E., Director of Bureau of Instruction, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

1881

Danse, Leopold O., C. E.

1883

Coffin, William C., C. E., Structural Engineer, Jones & Laughlin Co. Pittsburgh, Pa.

1884

Gray, James C., C. E.
McCabe, Junius, D., C. E., 341 Fourth Ave., Pittsburgh, Pa.

1885

*Bray, Harry E., C. E.
Buente, Charles F., C. E.
Carey, Joseph F., C. E., 4241 University Boulevard, Santiago, California.
Mesta, George F., C. E., President Mesta Machine Co., Pittsburgh, Pa.
Stewart, Reid T., C. E., Head of Department of Mechanical Engineering, University of Pittsburgh; Consulting Engineer, National Tube Co., Pittsburgh, Pa.

1886

McKean, Robert Andrews, C. E., Superintendent Structural Dept., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Patterson, Peter C., Eng., Chief Engineer, National Tube Co., Frick Bldg., Pittsburgh, Pa.

Rosewell, Joseph T., C. E.

1887

Barbour, George Hurlbut, C. E., Asst. Chief Mechanical Engineer, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

Lyons, James K., C. E., Civil Engineer, Gas Power Engineering Corporation, Pittsburgh, Pa.

Nicholson, John H., Eng., Manufacturer, 3rd Vice President, Shelby Steel Tube Co., Frick Bldg., Pittsburgh, Pa.

Stoner, Frank R., Eng., Attorney, 1307 Berger Bldg., Ptitsburgh, Pa.

Taylor, Samuel E., C. E., Civil and Mining Engineer, Pittsburgh, Pa.

1888

Bright, Frederick, C. E, Checking Structural Drawings, Empire Bridge Co., Elmira, N. Y.

Crider, James L., C. E., Chief Engineer, New York, Westchester and Boston Ry. Co., 65 Beaver St., New York City.

Gilfillan, George A., C. E., Consulting Engineer, 341 Fourth Ave., Pittsburgh, Pa.

Jenkins, Jenks B., C. E., Asst. Engineer, Baltimore & Ohio R. R., Mt. Royal Station, Baltimore, Md.

McCormick, Roscoe T., C. E., Manager of Sales, Petroleum Iron Works Co., Irwin, Pa.

Smith, Richard Lesnett, C. E., Consulting Engineer, Smith & Lewis, 1444-5-6 Oliver Bldg., Pittsburgh, Pa.

1889

Barrett, John Henry, C. E., Consulting Engineer, B. & O. Bldg., Baltimore, Md.

1890

Ehlers, Charles W., C. E., Asst. Engineer, Bureau of Surveys, Pittsburgh, Pa.

*Herron, George K., C. E.

Johnston, John P., C. E., General Manager, The New York Engine Co., Watertown, New York.

Langenheim, Gustave C., 403 Times Bldg., Pittsburgh, Pa.

1891

Carhart, Charles F., C. E., Salesman, Citizens Wholesale Supply Co., Columbus, Ohio.

Hays, James W., C. E., Civil Engineer, 55 Schmidt Bldg., Pittsburgh, Pa.
Liggett, Dudley S., C. E., Real Estate & Insurance, 705 Peoples Bank Bldg., Pittsburgh, Pa.

Mollenhauer, Frederick H., C. E., Engineer, Monongahela Nat. Gas Co., Pittsburgh, Pa.
McCabe, William P., C. E., Structural Steel Engineer, W. N. Kratzer & Co., Smallman St., Pittsburgh, Pa.
McGrew, John, C. E., John & Edward McGrew, Civil Engineers, 818 Empire Bldg., Pittsburgh, Pa.

1892

Cooper, Frederick M., C. E., of Edeburn Cooper & Co., Civil Engineers, 1201 Berger Bldg., Pittsburgh, Pa.
Davis, Charles W., M. E., Sales Manager, Standard Underground Cable Co., Pittsburgh, Pa.
Donaldson, Joseph T., C. E., Civil Engineer, Riter-Conley Mfg. Co., Water St., Pittsburgh, Pa.
Emmons, Charles DeMoss, C. E., General Manager, Chicago, South Bend & Northern Indiana Ry. Co., South Bend, Ind.
Isenthal, Leo Ralph, C. E., Railway Constructor and Operator, Stern & Silverman Inc., 605 Land Title Bldg., Philadelphia, Pa.
Kunkle, Charles E., C. E., Chief Draftsman, Keystone Works, Jones & Laughlin Steel Co., Pittsburgh, Pa.
Pittsburgh, Pa.
Miles, J. Walter, C. E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
McGrew, Anson B., C. E., U. S. Asst. Engineer. United States Engineer.
Nagle, James C., C. E.
Purdy, William G., C. E., Office, Farmers Bank Bldg., Pittsburgh, Pa.
Rhea, Frank C., C. E.
Rose, George R., C. E., Merchant, 539 Lincoln Ave., Bellevue, Pa.
*Smith, John F., C. E.
Wittmer, George, Jr., M. E., Asst. General Manager, American Natural Gas Co., 407 Park Bldg., Pittsburgh, Pa.

1893

Bratt, Berton, M. E.
*Bright, Paul, C. E.
Calvert, George H., C. E., Attorney, Blakeley & Calvert, Oliver Bldg., Pittsburgh, Pa.
Douthitt, Philip, C. E., Civil Engineer, 1347 Bluff St., Pittsburgh, Pa.
Elliott, James R., C. E., Consulting Engineer, Arlington Station, California.
*Flack, Charles A., C. E.

Godfrey, Edward, C. E., Engineer with R. W. Hunt Co., Monongahela Bank Bldg., Pittsburgh, Pa.

Lauman, Walter H., C. E., 1122 Carnegie Bldg., Pittsburgh, Pa.

Ridinger, Charles W., E. E., President, Iron City Engineering Co., Grant St., Pittsburgh, Pa.

Sapp, Edward H., C. E., Civil Engineer, New York Shipbuilding Co., Camden, N. J.

Shaler, Edward C., C. E., Office Engineer, Way & Structure Dept., Brooklyn Rapid Transit Co., 85 Clinton St., Brooklyn, N. Y.

Scott, Walter C., Eng., Pittsburgh Manager, David Lupton's Sons Co., 1415 Oliver Bldg.

Swan, John, Jr., Eng., 1105 Allegheny Ave., N. S., Pittsburgh, Pa.

Wylie, Thomas B., Eng., Mechanical Engineer, Equitable Water Co., 422 First Ave., Pittsburgh, Pa.

1894

Affelder, Louis J., C. E., Assistant Division Contracting Manager, American Bridge Co., Frick Bldg., Pittsburgh, Pa.

Brown, Robert C., C. E.

Clark, Milnor P., E. E., Mechanical Engineer with National Tube Co., 1718 Frick Bldg., Pittsburgh, Pa.

Dammond, William H., C. E., Civil Engineer, 86 Lee's Hill St., Sneinton, Nottingham, England.

Douglass, Robert McC., Eng., 306 Fourth Ave., Pittsburgh, Pa.

Dunlap, John H., Eng., Manufacturer, John Dunlap Co., Pittsburgh, Pa.

Gray, Guy M., C. E., Superintendent Motive Power, Bessemer & Lake Erie R. R., Greenville, Pa.

Hamilton, Alfred R., Eng., Coal Trade Bulletin, Park Bldg., Pittsburgh.

Howat, John B., Eng., President, Sharon Hardware Mfg. Co., Sharon, Pa.

Kehew, Everett E., Eng., Paying Teller, Keystone National Bank, Pittsburgh, Pa.

McEwen, John A., M. E., Manager Pittsburgh Office, Pittsburgh, Bridge & Iron Works, 1205 Farmers Bank Bldg., Pittsburgh, Pa.

Neubert, Walter P., E. E., Asst. Engineer, Union Switch & Signal Co., Swissvale, Pa.

Parkinson, David I., E. E., 323 Fourth Ave., Pittsburgh, Pa.

*Price, Jesse B., C. E.

1895

Dickey, Alfred C., C. E., Teacher of Mathematics, Shadyside Academy, Pittsburgh, Pa.

DuBarry, Dudley D., Eng., Draftsman, 129 N. Negley Ave., Pittsburgh, Pa.

DuBarry, Harry F., Eng., Salesman Carnegie Steel Co., 905 Maryland Ave., Pittsburgh, Pa.

Fawcett, Lewis B., Eng., Treasurer, Cheat Haven Coal & Coke Co., Machesney Bldg., Pittsburgh, Pa.

Gerwig, Frederick H. N., M. E., Asst. Supt., Edgar Thompson Furnaces, Carnegie Steel Co., Braddock, Pa.

Harrer, Henry, E. E., Farmer, Belgrade, Montana.

Hay, Paul Liscomb, M. E., Mechanical Engineer, Samuel Hay's Sons, 1408 Keenan Bldg., Pittsburgh, Pa.

Hoerr, Alexander L., M. E., Steam and Hydraulic Engineer, National Tube Co., McKeesport, Pa.

Hunter, Percy E, M. E., Independent Bridge Co., North Side, Pittsburgh, Pa.

Kirker, Albert H., M. E., Draftsman, U. S. Radiator Corporation, West Newton, Pa.

Macfarren, Walter W., M. E., Mechanical Engineer, Pittsburgh, Pa.

McKee, D. Gregg, E. E., Treasurer, Pittsburgh Trust Co., Fourth Ave., Pittsburgh, Pa.

Nevin, William C., Eng., 431 Fifth Ave., Pittsburgh, Pa.

Richey, Charles W., C. E., Master Carpenter, Pennsylvania R. R. Co., East Liberty Station, Pittsburgh, Pa.

Steel, Gardner, Eng.

Trees, Joseph C., M. E., President, Benedum-Trees Oil Co., Union Bank Bldg., Pittsburgh, Pa.

Wilson, Henry M., M. E., District Agent, Pittsburgh Valve, Foundry & Construction Co. ,978 Rockefeller Bldg., Cleveland, Ohio.

1896

*Beckert, Jacob C., M. E.

Boyd, Thomas W., Eng., Architect, Boyd & Stewart, Century Bldg., Pittsburgh, Pa.

Dietz, Louis A., C. E., Engineer, Dietz Engineering Co., 50 Church St., New York City.

Elverson, Howard W., Eng., General Foreman, Miscellaneous Dept., Pressed Steel Car Co., Pittsburgh, Pa.

Farrar, Silas Clarke, M. E., Mechanical Engineer, Bureau of Water, 532 Oliver Bldg., Pittsburgh, Pa.

Francies, William H., C. E., Asst. Superintendent, County Roads, Court House, Pittsburgh, Pa. 7 Center Ave., Emsworth, Pa.

Glaubitz, Hugo, C. E., General Superintendent Water Works and Chemical Dept., London, Ont.

Harlow, James Hayward, Jr., C. E., President Havre de Grace Electric Co., Havre de Grace, Md.

Horner, Joseph J., E. E., 900 Sherman Ave., N. S., Pittsburgh, Pa.

House, Edward B., Eng., Professor of Civil and Irrigation Eng., Colorado Agricultural College, Ft. Collins, Colorado.

Hunter, H. M. L., M. E., Salesman, Carnegie Steel Co., Cincinnati, Ohio.

Jack, Wilbur Lee, Eng., 55 Water St., Pittsburgh, Pa.

McCullough, Harvey V., C. E., W. T. McCullough Electric Co., 2315 Penn Ave., Pittsburgh, Pa.

McMaster, Robert T., C. E., Inspecting Engineer, Pittsburgh & Lake Erie R. R., 339 W. Federal St., Youngstown, O.

Neeld, Charles M., C. E., General Contractor, Oliver Bldg., Pittsburgh, Pa.

Neely, Wm. R., M. E., General Manager of Sales, Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.

Noble, Howard A., Eng., Mechanical Engineer, 1417 Farmers Bank Bldg., Pittsburgh, Pa.

Porter, James C., Eng.

Rust, Frank, Jr., Eng., 1341 Kentucky Ave., Pittsburgh, Pa.

Spencer, Stewart C., Eng., Horticulturist, Ocean Springs, Mississippi.

Strassburger, Dan S., C. E., Merchant, Atlantic Glass Co., 225 Water St., Pittsburgh, Pa.

Tanner, J. Roy, Eng., General Manager, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa.

Wittmer, Thomas, Eng., Civil Engineer, American Natural Gas Co., Park Bldg., Pittsburgh, Pa.

1897

Bennett, Edward, E. E., Professor of Electrical Engineering, University of Wisconsin, Madison, Wis.

Biggs, George W., Jr., C. E., Chief Engineer, American Water Works & Guarantee Co., Pittsburgh Bank for Savings Bldg., Pittsburgh, Pa.

Bradshaw, William M., E. E., 400 Whitney Ave., Wilkinsburg, Pa.

Bright, Graham, E. E., Electrical Engineer, Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.

Davis, Alfred C., E E., Superintendent, American Mfg. Concern, Falconer, New York.

Dornbush, Charles C., C. E., Assistant Chief Draftsman, Structural Dept., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Francies, Edward S., C. E.

Hoopes, Henry T., E. E., Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa.

Johnston, Edward VanDeusen, M. E., Penn and Fairmount Aves., Pittsburgh, Pa.

Kier, Samuel M., E. E., Manufacturer, Kier Fire Brick Co., Oliver Bldg., Pittsburgh, Pa.

Kiser, Alexander B., E. E., Supt. Electrical Equipment, Pittsburgh Coal Co., Oliver Bldg., Pittsburgh, Pa.

Liggett, Sidney S., Eng., Manager of Bond Dept., Union Trust Co., Pittsburgh, Pa.

Morganstern, Ralph M., E. E., Electrical Engineering Contractor, 325 Second Ave., Pittsburgh, Pa.

Plecker, Mayburt, C. E.

Rankin, Harry H., C. E.,

Shrom, William G., M. E., Salesman, George T. Ladd Co., 1620 Farmers Bldg., Pittsburgh, Pa.

Trimble, Alexander F., C. E., Division Engineer, Erie Railroad, Dunmore, Pa.

Wilde, Herbert K., C. E., 712 E. Diamond St., N. S., Pittsburgh, Pa.

Woolridge, Charles L., Eng., Superintendent of Buildings, Board of Public Education, 735 Fulton Bldg., Pittsburgh, Pa.

1898

Butz, Harry A., E. E.

Cochran, Charles E., C. E., Draftsman, Penn Engineering Works, New Castle, Pa.

Drexler, Louis A., Eng., Bethany Beach, Delaware.

DeVore, Henry C., M. E., 501 W. Main St., Monongahela, Pa.

Goldie, William, Jr., M. E., Goldie Mfg. Co., Bay City, Michigan.

Hindman, Wm. S. ,C. E.,

Hurst, Oliver C., M. E., General Insurance, Benedum-Trees Bldg., Pittsburgh, Pa.

Kelly, Henry E., E. E., Tionesta, Forest Co., Pa.

Riley, Albert D., M. E., 114 Liberty Ave., New York.

Slaymaker, Philip K., M. E., Asst. Professor of Applied Mechanics and Machine Design, University of Nebraska, Lincoln, Nebraska.

Smith, J., Hammond, E. E., Head of Department of Civil Engineering, University of Pittsburgh, Pittsburgh, Pa.

Sperling, George C., C. E., Mechanical Draftsman, Midvale Steel Co., Philadelphia, Pa.

Taylor, John L., C. E., Engineer, American Bridge Co., Frick Bldg.,

1899

Biggert, Florence C., M. E., Mechanical Engineer, United Engineering & Foundry Co., 2318 Farmers Bank Bldg., Pittsburgh, Pa.

Collins, Palmer, M. E., Asst. Supt., South Works, American Steel & Wire Co., Frick Bldg, Pittsburgh, Pa.

Gray, Arthur E., M. E., 5823 Nicholson St., Pittsburgh, Pa.

Hanna, Roscoe E., Eng., Clerk Philadelphia Co., 435 Sixth Ave., Pittsburgh, Pa.

Irwin, Lee S., Eng., Mfg. of Lamps and Sheet Metal Products, East Lacock St., North Side, Pittsburgh, Pa.

*Miller, Ralph R., C. E.

Mould, Edmund F., Eng.

Murry, John S., C. E., 1108 Ross Ave., Wilkinsburg, Pa.

Palmer, George B., Eng., Engineer, Right of Way, Pennsylvania Lines West, 1125 Union Station, Pittsburgh, Pa.

Pennington, Harley, M. E., Mechanical Engineer, United Engineering & Foundry Co., 2325 Farmers Bldg., Pittsburgh, Pa.

Peterson, Albert A., Eng., Civil Engineer, 6945 Hamilton Ave., Pittsburgh, Pa.

Price, Philip W., C. E., Civil Engineer, County Engineer Office, Court House, Pittsburgh, Pa.

Reid, Samuel, C. E., Civil Engineer, Pittsburgh & Lake Erie R. R., Beaver Falls, Pa.

Roberts, Elijah R., E. E., Mechanical Superintendent Kaufman Dept. Stores, Inc., Pittsburgh, Pa.

*Rogaliner, Morris L., C. E.

*Russell, John W., E. E.

Thomas, Edwin L., Eng.

Woodson, Howard D., C. E., Structural Engineer, Office of Supervising Architect, Treasury Department, Washington, D. C.

Wuth, William B., Eng., 830 Sheridan Ave., Pittsburgh, Pa.

1900

Bauer, George F., C. E., Civil Engineer, 156 W. Washington Ave., Rochester, Pa.

Blackadore, John, C. E.,

Coates, Edward S., E. E.

Collins, Frank S., M. E., National Valve & Manufacturing Co., City.

Fisher, Chester G., M. E., President, Scientific Materials Co., 771 Forbes St., Pittsburgh, Pa.

Gerber, Christian G., C. E., Civil Engineer, 706 Park Bldg., Pittsburgh. Pa.

Goehring, Chas. P., C. E., Chief Engineer, Pittsburgh, McKeesport & Westmoreland Ry. Co., 502 Fifth Ave., McKeesport, Pa.

Hammer, Howard G., Eng., Fire Insurance, 401 Peoples Bank Bldg., Pittsburgh, Pa.

Hunter, Samuel K., C. E., 366 Marshall Ave., Pittsburgh, Pa.

Lambie, Charles S., C. E., President, C. S. Lambie Co., Denver, Colo.

Layng, Frank R., Eng., Engineer of Track, Bessemer & Lake Erie R. R., Greenville, Pa.

Munroe, Chas. L., West Point Boiler Wks., 23rd and Smallman Sts., Pittsburgh, Pa.

O'Hagan, Charles F., C. E., Structural Engineer, Wm. B. Scaife & Sons, 221 First Ave., Pittsburgh, Pa.

Orr, Almer H., Eng., General Agent, Atlantic Coast Despatch, 839 Oliver Bldg., Pittsburgh, Pa.

Roessing, Frank M., C. E., Engineer and Contractor, Peoples Bank Bldg., Pittsburgh, Pa.

Smith, William Acheson, C. E., Vice President, International Acheson Graphite Co., Niagara Falls, N. Y.

Ward, Chas. A., M. E., 772 Lemington Ave., Pittsburgh, Pa.

1901

Barr, J. Toner, Eng., Civil Engineer, 237 Fourth Ave., Pittsburgh, Pa.

Benner, Jacob Wesley, M. E., Steam Engineer, Homestead Steel Works, Carnegie Steel Co., Munhall, Pa.

Cullers, William H., C. E., Chief Engineer, Northwest Steel Co., Portland, Oregon.

DesIslets, John C., Eng., Pressed Steel Car Co., Broad St., New York.

Earl, Howard A., C. E., Draftsman, Fort Pitt Bridge Co., Canonsburg, Pa.

Hansen, Wm. K. W., M. E., General Supt., Hockensmith Wheel & Mine Car Co., Penn Station, Pa.

Herr, Andrew G., Eng., Structural Draftsman, Springdale, Pa.

Hillman, John J., Jr., Eng., Oliver Bldg., Pittsburgh, Pa.

Hockensmith, Wilbur D., General Manager and 1st Vice President, Hockensmith Wheel and Mine Car Co., Penn Ave., Irwin, Pa.

Johnson, Frank E., Eng.

Knopf, Julius R., M. E.,

Miller, Frank Forest, M. E., Mechanical Engineer, Star Drillings Machine Co., Akron, Ohio.

Miller, John A. W., M. E., Asst. Superintendent, Gas Department, Pittsburgh Plate Glass Co., Ford City, Pa.

Mitchell, Wm. H., M. E., Inspector, The Niagara Falls Power Co., Bethlehem Steel Co., South Bethlehem, Pa.

Moody, William Falley, Eng. Paper Merchant, S. Croton Avenue, New Castle, Pa.

Murdock, Wm. H., Eng., Contractor, Pittsburgh, Pa.

Paul, Earl W., E. E., Earl W. Paul, Electrical Engineers, Upland, Calif.

*Ransom, George W., E. E.,

Watt, Herman E., M. E., Supt., Huntington Water Co., Huntington, W. Va.

1902

Brinker, Wm. E., Eng., Real Estate, Colonial Bldg., Wellsburg, W. Va.

Chalfant, Frederick B., C. E., Assistant Engineer, Bureau of Engineering, Pittsburgh, Pa.

Dougherty, L. H., C. E., Ingram, Pa.

Eisenbeis, Walter H., E. E., Engineering Salesman, Union Steel Casting Co., Pittsburgh, Pa.

Farmer, J. McD., Eng., Canonsburg, Pa.
Fullerton, Hugh, L. ,E. E., Electrical Engineer, Duquesne Light Co., Pittsburgh, Pa.
*Gibson, Will N., C. E.
Hoffman, John W., Eng., Paying Teller, Pittsburgh Trust Co., Box 596, Pittsburgh, Pa.
Linn, Guy F., M. E., American Water Wks. and Guarantee Co., Pittsburgh, Pa.
McConnell, Malcolm F., M. E., Superintendent, Mingo Works, Carnegie Steel Co., Mingo Junction, Ohio.
Ramsey, Frank R., C. E., Chief Engineer, Toledo, St. Louis & Western R. R., Frankfort, Ind.
Sulzner, George T., Eng.
Wallace, Richard W., E. E., 1014 Evergreen Ave., Millvale, Pa.
Weldin, Wm. A., C. E., Asst. Chief Engineer, Pittsburgh-Buffalo Co., 408 Frick Bldg., Pittsburgh, Pa
Wiley, James Garfield, C. E.

1903

Boothe, Willis, C. E., Murrayhill Ave., Pittsburgh, Pa.
Brown, Thomas H., C. E., Division Engineer, Baltimore & Ohio Southwestern, Flora, Ill.
Dodds, Samuel R., E. E., Electrical Engineer, Pittsburgh Railways Co., 373 S. Atlantic Ave., Pittsburgh, Pa.
Edwards, Edward T., M. E., Manager, Vanadium Alloys Steel Co., Latrobe, Pa.
Fitzharris, Frederick T., C. E., Engineer, Pittsburgh Terminal Railroad and Coal Co., Wabash Bldg., Pittsburgh, Pa.
Guenther, Emil B., M. E., Mechanical Engineer, Westinghouse Machine Co., East Pittsburgh, Pa.
Hogg, David M., M. E., Contractor, 804 Penn Ave., Pittsburgh, Pa.
Machesney, Harold C., Eng., Bridge Engineer, American Bridge Co., Ambridge, Pa.
McCutcheon, Norman D., C. E., Civil Engineer, National Fire Proofing Co., John Hancock Bldg., Boston, Mass.
Stein, Adam, Jr., E. E., Electrical Engineer, American Telephone & Telegraph Co., New York City.
Todd, George C., C. E., Beaver Falls, Pa.
Turner, George F., C. E., Civil Engineer, Smith & Turner, 410 Dollar Bank Bldg., Youngstown, Ohio.
Waggoner, Charles W., C. E., Structural Estimator, Pittsburgh Bridge & Iron Works, Rochester, Pa.
Wahr, Harry F., M. E., Secretary & Asst. Sales Manager, Mesta Ma- Pittsburgh, Pa.

Warne, Charles C., M. E., Asst. Engineer, N. Y. C. & H. R. R., 81 East 125th St., New York City.
Worcester, Winthrop S., E. E., Farmer, Forest View Farm, Hallowell, Maine.

1904

Byers, Orah M., E. E., Electrical Engineer, American Window Glass Co., Jeannette, Pa.
Cooper, Walter S., C. E., Civil Engineer, Creston, Montana.
Craig, Paul S., C. E., Draftsman, Sacramento Valley Irrigation Co., Maxwell, California.
Crampton, B. P., E. E.
Dawson, Wm. E., C. E., U. S. Engineer Office, Dubuque, Ia.
Dornbush, George A., C. E., Estimator (Structural Steel), Jones & Laughlin Steel Co., Pittsburgh, Pa.
Ellwood, Orville A., M. E., Erecting Engineer, Wm. B. Scaife & Sons Co., First Ave., Pittsburgh, Pa.
Ehrman, Sidney, C. E., State St., Baden, Pa.
Filson, George C., C. E., Engineer in Charge, Pennsylvania Co., 1103 Union Station, Pittsburgh, Pa.
Gormley, Frank N., C. E., 112 Hemlock St., N. S., Pittsburgh, Pa.
Jones, Lester B., M. E., Automobile Tester, McAllister Bros. Motor Car Co., Baum and Beatty Sts., Pittsburgh, Pa.
Junkin, Hays MacLean, M. E., 704 Empire Bldg., Pittsburgh, Pa.
Libbey, James T., C. E., Contract Agent, Nelson-Merydith Co., 200 Lewis Block, Pittsburgh, Pa.
McHenry, Thomas, C. E., Civil Engineer, Pennsylvania Lines, 1007 Union Station, Pittsburgh, Pa.
McKirdy, Charles W., M. E., Chief Engineer, Louisiana Bridge Co., 1892 Napoleon Ave., New Orleans, Louisiana.
McKenna, Roy C., C. E., McKenna Bros. Brass Co., First Ave. and Ross St., Pittsburgh, Pa.
Page, Illtid A., M. E., Checker, Des Moines Bridge and Iron Works, Curry Bldg., 12 Niagara St., Pittsburgh, Pa.
Rosser, Chas. M., E. E., Contractor, Rosser & Maloney, Bellaire, Ohio.
Shanor, Edgar E., M. E., Chief Draftsman, Petroleum Iron Works, Sharon, Pa.
Taylor, Charles E., C. E., Civil and Mining Engineer, 7 Wood St., Pittsburgh, Pa.
Wagner, Gustave E. T., M. E., Chief Draftsman, Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Weeks, Alfred B., M. E.

1905

Crea, Thomas C., C. E., Supervisor of Sructure, Bessemer & Lake Erie R. R., Greenville, Pa.

Dambach, Wm. N., C. E., Asst. Supt. of Buildings, 135 Fulton Bldg., Pittsburgh, Pa.

Davis, Roland R., E. E.

Duff, John Milton, M. E., Mechanical Engineer, American Steel & Wire Co., Pittsburgh, Pa.

Finley, William P., C. E., Craig, Colorado.

Henrici, Frederick Wm., C. E., Engineer, Erecting Dept., American Bridge Co., Ambridge, Pa.

Jones, Archie R., C. E., Asst. Supervisor of Tracks, Eastern Division, N. Y. C. & H. R. R. Co., New York. Address—Jersey Shore, Pa., Vilas Station.

Knight, Walter S., M. E., 911 Evans Ave., McKeesport, Pa.

Kramer, Frank P., M. E., American Steel & Wire Co., Pittsburgh, Pa.

Maxwell, Robert G., C. E., Draftsman, Fort Pitt Bridge Works, Canonsburg, Pa.

McFarland, James C., C. E., Civil Engineer, Buffalo & Lake Erie Traction Co., 202 State St., Erie, Pa.

McIntyre, John N., C. E., District Safety Inspector, American Steel & Wire Co., Pittsburgh, Pa.

Partington, Joshua A., M. E., Draftsman, Riter-Conley Mfg. Co., Leetsdale, Pa.

Rall, Robert O., M. E., Asst. Chief Draftsman, American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa.

Reineman, Walter G., C. E., Auto & Cycle Supplies, 20 W. Stockton Ave., N. S., Pittsburgh, Pa.

Rogaliner, William L., M. E., Draftsman, Bureau of Engineering, Pittsburgh, Pa.

Schaeffer, James G., M. E.

Stuebner, Ruben, C. E., Structural Draftsman, American Bridge Co., Chicago, Ill.

Willock, Sylvester R., M. E., Sales Manager, Treadwell Engineering Co., Easton, Pa.

1906

Adams, Frank N., M. E., 1203 Resaca Place, N. S., Pittsburgh, Pa.

Bender, Allan P., E. E., Electrical Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Brunner, Elmer H., C. E., Engineer, G. & P. R. R. Co., Armstead, Montana.

Daugherty, R. L., E. E., Electrical Contractor, Center Ave. and Neville St., Pittsburgh, Pa.

Handleman, Morris, C. E.

Harlan, Clarence H., C. E., Contracting Engineer, McClintic-Marshall Construction Co., Pittsburgh, Pa.

Marsh, Howard G., M. E., Carnegie Steel Co., McCutcheon Mill, N. S., Pittsburgh, Pa.

Mitchell, Wayne S., E. E., Beaver, Pa.

Mulheim, Chas. B., M. E., Instructor in Mathematics, Rochester High School, Rochester, Pa.

McClelland, Robert T., C. E.

Price, Edward K., E. E., Advertising, Manager, Standard Underground Cable Co., Pittsburgh, Pa.

Reuter, Wm. C., M. E., Draftsman, American Bridge Co., Ambridge, Pa.

Schaefer, Ralph G., C. E., Civil Engineer, T. W. Phillips Gas and Oil Co., Butler, Pa.

Silliman, Guy F., C. E.

Taylor, Ernest S., C. E., 5400 Darlington Road, Pittsburgh, Pa.

Truxal, Edward L., M. E., Chief Draftsman, American Steel & Wire Co., Braddock Plant, Braddock, Pa.

Weldin, Walter J., C. E., Clerk, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.

Werner, Edward H., M. E., Designer and Checker, United Engineering and Foundry Co., Farmers Bank Bldg., Pittsburgh, Pa.

Whyte, Robert, M. E., Sales Engineer, American Foundry & Construction Co., Pittsburgh, Pa.

Wilson, Albert John E., Jr., C. E., Jones & Laughlin Steel Co., Pittsburgh, Pa.

Wynne, Clarence B., Eng., American Bridge Co., Ambridge, Pa.

1907

Ambrose, Frederic B., E. E., Salesman, Westinghouse Electric & Mfg. Co., Union Bank Bldg., Pittsburgh, Pa.

Bole, Thomas M., C. E., Engineer, in charge.
Chicago, Ill.

Carhart, Thomas C., C. E., Civil Engineer, Aluminum Co. of America, New Kensington, Pa.

Cooper, Wm. M., M. E., Draftsman, Pressed Steel Car Co., Pittsburgh, Pa.

Creelman, Leonidas J., C. E., Draftsman, American Bridge Co., Shiffler Plant, 48th St., Pittsburgh, Pa.

Dinger, Layard E., C. E.

Douglass, Thomas L., C. E., 410 Fifteenth St., New Brighton, Pa.

Elliott, Welday S., M. E., 1517 Tindal St., Pittsburgh, Pa.

Fisher, Wm. Clifford, C. E., Civil Engineer, Nampa, Idaho.

Glueck, Robert J., E. E., General Electric Company, Harrison, N. J.

Hartman, Charles M., M. E., Superintendent, Mechanical Dept., Ward Motor Vehicle Co., Concord Ave. and E. 143rd St., New York City.

Horne, George H., E. E., Engineer, Nampa, Idaho.

Lambie, Joseph Sioussa, C. E., Assistant Professor of Civil Engineering, University of Pittsburgh, Pittsburgh, Pa.

Mitchell, Lindsay LaC., E. E., Superintendent, Pittsburgh Transformer Co., North Side, Pittsburgh, Pa.

*Murray, William M., C. E.

Piper, Theodore J., C. E., Structural Draftsman, John Eichlay, Jr., Co., S. S., Pittsburgh, Pa.

Rose, Chester F., Eng., Signal Repairman, Pennsylvania Co., Lines West, Baden, Pa.

Schreiber, John W., M. E., Draftsman, Aluminum Co. of America, New Kensington, Pa., 6320 Burchfield Ave., Pittsburgh, Pa.

Schweppe, Walter, M. E.,

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Van Blarcom, Conant, M. E.

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1908

Angle, Philip E., M. E., Carnegie Steel Co., Blast Furnace Dept., Duquesne, Pa., 5728 Baum Blvd., Pittsburgh, Pa.

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Boddie, Clarence A., E. E., Erecting Engineer, Westinghouse Electric & Mfg. Co., 730 Board of Trade Bldg., Boston, Mass.

Curry, Grant, M. E., LL.B., 1118 Park Bldg., Pittsburgh.

Desch, John L., C. E., Morristown Traction Co., Morristown, N. J.

Edgar, Wm. C., C. E., Civil Engineer, Samuel E. Duff, Consulting Engineer, Empire Bldg., Pittsburgh, Pa.

*Eshelman, R. D., C. E.

Harley, John D., M. E., Draftsman, Crucible Steel Co., 626 Watt St., Pittsburgh, Pa.

Inglefield, Chas. L., E. E., Junior Engineer, U. S. Engineer's Office, Georgetown, Pa.

Jamison, Richard H., C. E., 723 Whitney Ave., Wilkinsburg, Pa.

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Keenan, Albert W., C. E., Seventh and Poplar Sts., St. Louis, Mo.

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Magraw, Harry D., M. E., Mechanical Draftsman, National Tube Co., McKeesport, Pa.

Mohler, Ross Chester, M. E.

McKee, Edwin B., M. E., Mesta Machine Co., West Homestead, Pa.

Price, David R., E. E.

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Sherbon, George E., C. E., Brownsville, Pa.

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Smith, Kosciusko McC., E. E.

Turner, Charles Alex, E. E., Electrical Engineer, The Pacific Telephone & Telegraph Co., 140 N. Montgomery St., San Francisco, Cal.

Vandivort, Samuel E., C. E., McKelvy & Hine, 24½ Falls Ave., Youngstown, Ohio.

1909

Boland, Jerome A., C. E., Civil Engineer, American Steel & Wire Co., Donora, Pa.

Cannon, Edgar C., C. E., Donora Steel Wks., Donora, Pa.

Decker, James G., C. E., National Fire Proofing Co., Pittsburgh, Pa.

Farris, John, C. E., Contracting Engineer, Farris Bridge Co., Jenkins Arcade Bldg., Pittsburgh, Pa.

Long, Frederick A., C. E., 224 Meyran Ave., Pittsburgh, Pa.

Martin, James R. McI.. E. E., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

McCandless, Wm. J., C. E.

McElhinney, John H., M. E., Construction Supt., Federal Engineering Co., 1116 House Bldg., Pittsburgh, Pa.

McFeeters, Guy S., C. E., Civil Engineer, United States Government, Lock No. 4, Pa.

McGura, Jerome S., E. E.

McIntyre, Elmer L., C. E., Estimating Dept., John Eichley, Jr., Co., Pittsburgh, Pa.; 131 Walnut St., Swissvale Sta., Pittsburgh P. O.

Neeld, Almos D., Jr., C. E., Construction Engineer, 234 Fourth Ave, Pittsburgh, Pa.

Parr, William P., E. E.

Renton, Thomas E., Jr., M. E., Asst. to President, Greenwood Construction Co., Pittsburgh, Pa.

Renton, Walter C., M. E., Draftsman, Union Switch & Signal Co., Swissvale, Pa.

Risacher, Joseph L., M. E.

Roessing, Lawrence W., C. E., Civil Engineer, American Steel & Wire Co., Donora, Pa.

Rudolph, Clyde A., E. E.

Supplee, Charles W., C. E., U. S .Engineer's Office, Farmers Bank Bldg., Pittsburgh, Pa.

Thomas, Bennett T., C. E., Conemaugh Division, P. R. R., 1003 Penn Ave., Pittsburgh, Pa.

Wallace, Frederick J., E. E., Electrical Engineer, United States Government, Corozal, Panama.

Weber, John, Jr., M. E., Instructor in Mechanical Engineering, University of Pittsburgh, Pittsburgh, Pa.

Willock, Roy Leech, M. E., Designer and Estimator.

1910

Campbell, John T., C. E., Bureau of Water, City of Pittsburgh, Oliver Bldg., Pittsburgh, Pa.

Crum, Frank M., C. E., Eng. Corps, C. & P. Division, Pennsylvania Co., 5713 Euclid Ave., Cleveland, Ohio.

Davis, Karl E., C. E., Associate Editor, Coal Trade Bulletin, 421 Park Bldg., Pittsburgh, Pa.

Dygert, Warren B., C. E., Civil Engineer, P. C. C. & St. L. R. R,, 1913 Penn Ave., Pittsburgh, Pa.

Ferree, Eugene C., E. E., Electrical Engineer, National Tube Co., McKeesport, Pa.

Frazier, Albert S., C. E., 1935 Perrysville Ave., N. S., Pittsburgh, Pa.

Haynes, Harold A., E. E., Instructor in Electrical Engineering, Howard University, Washington, D. C.

Kincaid, C. W., E. E., Engineer, Westinghouse Electric & Mfg.. Co., Industrial Division Engineering Dept., East Pittsburgh, Pa.

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Millar, Wm. E., C. E., Inspector, American Bridge Co., Ambridge, Pa.

Mueller, Robert G., M. E., Automobile Business, Alco-Pittsburgh Sales Co., Ellsworth and College Aves., Pittsburgh, Pa.

Mueller, William F., Automobile Business, Alco-Pittsburgh Sales Co., Ellsworth and College Aves., Pittsburgh, Pa.

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Reizenstein, Harry S., E. E., Westinghouse Electric & Mfg. Co., Export Division, East Pittsburgh, Pa.

Richards, Robert W., M. E., Standard Steel Car Co., Butler, Pa., 719 N. McKean St., Butler, Pa.

Roberts, James M., C. E., Civil Engineer, Riter-Conley Mfg. Co., Pittsburgh, Pa.

Taylor, Allan R., C. E., 1245 Hamlin St., N. E., Washington, D. C.

Voelker, Aloys, C. E., 4029 Duquesne Ave., N. S., Pittsburgh, Pa.

Wynne, Arthur V., Eng., General Supt., Massilon Electric & Gas Co., Massilon, Ohio.

Young, Roy A., Eng., Draftsman, Pennsylvania Lines West of Pittsburgh, 1125 Pennsylvania Station, Pittsburgh, Pa.

1911

Abel, Albert, E., M.E., Engineering Assistant, Hubbard Steel Foundry Company, 4344 Magoun Avenue, East Chicago, Indiana.

Conwell, Erle McK., E.E., Wire Chief, C. D. & P. Telegraph Company, Sharpsburg, Pa., 107 Richdale St., N. S., City.

Eades, H. S., M.E., Draftsman, American Bridge Company, Ambridge, Pa.

Farmer, Homer G., C.E., Testing Laboratories, Universal Portland Cement Company, 609 Sterrett Street, Pittsburgh, Pa.

Hague, Floyd T., E.E., Engineer, Westinghouse Electric & Manufacturing Company, 7532 Hamilton Avenue, City.

Handmacher, Benjamin B., E.E., Plant Dept., Western Union Telegraph Company.

Johnston, Arthur S., M.E., Special Apprentice, Westinghouse Air Brake Company, 709 Ninth Avenue, Beaver Falls, Pa.

Lowe, Harold Clifton, C.E., U. S. Engineer's Office, 825 Ridge Ave., N. S., Pittsburgh, Pa.

Mesta, Lewis W., M.E., Mesta Machine Co., Box 1124, Pittsburgh, Pa.

Miller, John Hays, C.E., Engineer, John F. Casey Construction Co., 3519 Fifth Avenue, Pittsburgh, Pa.

Moore, Jay R., E. E., Manager of Works Office, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Myler, Thomas K., C.E., Engineer, Clinton Gas & Electric Co., Clinton, Iowa.

McCutcheon, Kenneth D., C.E., National Fire Proofing Co., Boston, Mass., 31 Winchester St., Brookline, Mass.

Oleson, Walter A., Inspector, Factory Insurance Association, 644 E. Street, N. E. Washington, D. C.

Reed, Charles S., E.E., Durham Traction Co., Durham, N. C.

Robbins, Samuel, C.E.

Robinson, Parker M., M.E., Fore River Shipbuilding Company, 16 S. Central Terrace, Wollaston, Mass.

Seanor, Francis W., M.E.

Shapiro, Harry, C.E., Draftsman Bridge Department, B. & O. R. R., Baltimore, Md.

Simon, Richard J., E.E., Engineer, Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa. Address 1906 Lowry St., N. S., City.
19 Clifton Blvd., Carrick, Pa.

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122 Fifth Avenue, Pittsburgh, Pa.

1912

Coyle, George Love, C.E., Civil Engineer, Tellico River Lumber Co., Tellico Plains, Tenn.

Ellis, Lester D., M.E., Machinist, Experimental Department, 1535 Spring

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Everhart, Samuel Dunlap, Jr., M.E., Pittsburgh Valve Foundry & Machine Co., Pittsburgh, Pa.

Hallock, John Wilson Wishart, M.E., Junior Engineer, War Dept., Washington, D. C. 1310 Belmont St., N. W., Washington, D. C.

Kammer, Glenn Donald, Chemist, Standard Chemical Co., Vanaium Bldg.,

Kammer, Glenn Donald, Chemist, Standar dChemical Co., Vanadium Bldg., Pittsburgh, Pa.

Mannion, Michael Francis, Monongahela Division, Pennsylvania Lines.

Mueller, Richard William, M.E.

Muntz, Richard, E.E., Lineman's Helper, Pittsburgh Crucible Steel Company, Midland Works, Midland, Pa. Address, 234 Insurance Street, Beaver, Pa.

McCluskey, William Oliver, Jr., C.E., Inspector, U. S. Government, Ohio River Dam, No. 12, Wheeling, W. Va.

McDaniel, William Lyle, Jr., C.E., Instrumentman, Chief Engineer's Office, P. C. C. & St. L. Ry., Pittsburgh, Pa. Address, 1105 Walnut Street, Wilkinsburg, Pa.

McIntyre, Lewis Wedsel, C.E., Assistant Engineer, Bureau of Engineering Dept., Public Works. Address, 3317 Ridgeway St., Pittsburgh, Pa.

Richards, Harold Eugene, M.E., Glenwood Natural Gas Co., Port Alma, Ontario, Canada, care of Doherty Co., New York City.

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Smith, Ralph Harold, C.E.,

Stern, Walter R., C.E., Estimator, Best Manufacturing Company. Address, 206 Chester Avenue, N. S., Pittsburgh, Pa.

Wilcox, Homer G., C.E., Aluminum Co., of America, 2422 Oliver Bldg. Address, 7148 Upland St., Pittsburgh, Pa.

1913

Buka, Simeon, B.S. in S. E., Engineer, Morris Knowles, Oliver Bldg., Pittsburgh, Pa.

Danzilli, Alfred Michael, B.S. in C.E., Engineer, American Bridge Company, Pittsburgh, Pa.

Eaton, Henry Taylor, B.S. in M.E., Engineer, Pennsylvania Railroad Company, Pittsburgh, Pa.

Glass, Robert Lewis, B.S. in E.E., Engineer, General Electric Company, New York City.

Jiminez, Amador, B.S. in E.E., Engineer, Pennsylvania Railroad Company, Pittsburgh, Pa.

Khanna, Jagannath, B.S. in E.E.

Gochnauer, Harry Wallis, B.S. in S.E., Appleton, Wis.

McCausland, Karl Voss, B.S. in M. E., Engineer, Clairton Steel Company, Clairton, Pa.

McQuown, William Charles, B.S. in M.E., Secretary of Pittsburgh Athletic Association, Pittsburgh, Pa.

Over, Raymond William, B.S. in E.E.

Schmertz, Percy, B.S. in E.E., Engineer, Westinghouse Electric and Manufacturing Co, East Pittsburgh, Pa.

Snyder, Clayton Edward, B.S. in E.E., Engineer, Pittsburgh Transformer Company, Pittsburgh, Pa.

Taylor, Leslie Milton, B.S. in M.E.

Vandivort, Robert Ellsworth, B.S. in C.E., Pittsburgh and Lake Erie Railroad Co., Pittsburgh, Pa.

ENGINEERING ALUMNI

UNIVERSITY OF PITTSBURGH

Name	Degree	Class
Abel, Albert E.	M.E.	1911
Adams, Frank N.	M.E.	1906
Affelder, Louis J.	C.E.	1894
Ambrose, Frederic B.	E.E.	1907
Angle, Philip E.	M.E.	1908
Barbour, George H.	C.E.	1887
Barr, J. Toner	Eng.	1901
Barrett, John H.	C.E.	1889
Bates, H. H.	C.E.	1908
Bauer, George F	C.E.	1900
*Beckert, Jacob C.	M.E.	1896
Bender, Allan P.	E.E.	1906
Benner, Jacob W.	M.E.	1901
Bennett, Edward	E.E.	1897
Biggert, Florence C.	M.E.	1899
Biggs, George W., Jr.	C.E.	1897
Blackadore, John	C.E.	1900
Boddie, Clarence A.	E.E.	1908
Boland, Jerome A.	C.E.	1909
Bole, Thomas M.	C.E.	1907
Boothe, Willis	C.E.	1903
Boyd, Thomas W.	Eng.	1896
Bradshaw, William M.	E.E.	1897
Bratt, Berton	M.E.	1893
*Bray, Harry E.	C.E.	1885
Bright, Frederick W.	C.E.	1888
Bright, Graham	E.E.	1897
*Bright, Paul	C.E	1893
Brinker, Wm. E.	Eng.	1902
Brown, Robert C.	C.E.	1894
Brown, Thomas H.	C.E.	1903
Brunner, Elmer H.	C.E.	1906
Buene, Charles F.	C.E.	1885
Butz, Harry A.	E.E.	1898
Byers, Orah M.	E.E.	1904
Calvert, George H.	C.E.	1893
Camp, James McIntyre	C.E.	1880
Campbell, John T.	C.E.	1910
Canfield, Maurice P.	C.E.	1876
Cannon, Edgar C.	C.E.	1909
Carey, Joseph F.	C.E.	1885
Carhart, Thomas C.	C.E.	1907
Chalfant, Frederick B.	C.E.	1902
Clark, Milnor P.	E.E.	1894
Coates, Edward S.	E.E.	1900
Cochran, Charles E.	C.E.	1898
Coffin, William C	C.E.	1883
Collins, Frank S.	M.E.	1900
Collins, Palmer	M.E.	1899
Conwell, Erle McK.	E.E.	1911
Cooper, Frederick M.	C.E.	1892
Cooper, Walter S.	C.E.	1904
Cooper, William M.	M.E.	1907
Coyle, George Love	C.E.	1912
Craig, Paul S.	C.E.	1904
Crampton, B. P.	E.E.	1904
Crea, Thomas C.	C.E.	1905
Creelman, Leonidas J	C.E.	1907
Crider, James L.	C.E.	1888
Crum, Frank M.	C.E.	1910
Cullers, William H.	C.E.	1901
Curry, Grant	M.E.	1908
Dambach, Wm. N.	C.E.	1905
Dammond, Wm. Hunter,	C.E.	1894
Daugherty, Rush L.	E.E.	1906
Davis, Alfred C.	E.E.	1897
Davis, Charles W.	M.E.	1892
Davis, Karl E.	C.E.	1910
Davis, Roland R.	E.E.	1905
Dawson, Wm. E.	C.E.	1904
Decker, James C.	C.E.	1909
Desch, John L.	C.E.	1908
DesIslets, John C.	Eng.	1901
DeVore, Henry C.	M.E.	1898
Dickey, Alfred C.	C.E.	1895
Dietz, Louis A.	C.E.	1896
Dinger, Layard E.	C.E.	1907
Dodds, Samuel R.	E.E.	1903
Donaldson, Joseph T.	C.E.	1892
Dornbush, Charles C.	C.E.	1897
Dornbush, George A.	C.E.	1904
Dougherty, Lemuel H.	C.E.	1902
Douglass, Robert McC	Eng.	1894
Douglass, Thomas L.	C.E.	1907
Douthitt, Philip	C.E.	1893
Drexler, Louis A.	Eng.	1898
DuBarry, Dudley D.	Eng.	1895
DuBarry, Harry F.	Eng.	1895
Duff, John M.	M.E.	1905
Dunlap, John H.	Eng.	1894
Dunnells, Clifford G.	Eng.	1896
Dygert. Warren B.	C.E.	1910
Eades, Herbert S.	M.E.	1911
Earl, Howard A.	C.E.	1901
Edgar, William C.	C.E.	1908
Edwards, Edward T.	M.E.	1903

Name	Degree	Class
Ehlers, Charles W.	C.E.	1890
Ehrman, Sidney	C.E.	1904
Eisenbeis, Walter H.	E.E.	1902
Elliott, James R.	C.E.	1893
Elliott, Welday S.	M.E.	1907
Ellis, Lester D.	M.E.	1912
Ellwood, Orville A.	M.E.	1904
Elverson, Howard W	Eng.	1896
Emmons, Charles DeM.,	C.E.	1892
*Eshelman, R. D.	C.E.	1908
Everhart, Samuel D., Jr.	M.E.	1912
Farmer, Homer G.	C.E.	1911
Farmer, James McD.	Eng.	1902
Farrar, Silas C.	M.E.	1896
Farris, John	C.E.	1909
Fawcett, Lewis P	Eng.	1895
Ferree, Eugene C.	E.E.	1910
Filson, George C.	C.E.	1904
Finley, William P.	C.E.	1905
Fisher, Wm. Clifford	C.E.	1907
Fisher, Chester G.	M.E.	1900
Fitzharris, Frederick T.	C.E.	1903
*Flack, Charles A.	C.E.	1893
Francies, Edward S.	C.E.	1897
Francies, Wm. H.	C.E.	1896
Frazier, Albert	C.E.	1910
Fullerton, Hugh L.	E.E.	1902
Ganter, Carl F.	Eng.	1904
Gerber, Christian G.	C.E.	1900
Gerwig, Frederick H. N.,	M.E.	1895
*Gibson, Wm. N.	C.E.	1902
Gilfillan, George A.	C.E.	1888
Glaubitz, Hugo	C.E.	1896
Glueck, Robert J.	E.E.	1907
Godfrey, Edward	C.E.	1893
Goehring, Charles P.	C.E.	1900
Goldie, William, Jr.	M.E.	1898
Gormley, Frank N.	C.E.	1904
Gray, Arthur E.	M.E.	1899
Gray, Guy McC.	C.E.	1894
Gray, James C.	C.E.	1884
Guenther, Emil B.	M.E.	1903
Hague, Floyd T.	E.E.	1911
Hallock, John W. W.	M.E.	1912
Hamilton, Alfred R.	Eng.	1894
Hammer, Howard G.	Eng.	1900
Handleman, Morris	C.E.	1906
Handmacher, Benj. B.	E.E.	1911
Hanna, Roscoe E.	Eng.	1899
Hansen, William K. W.,	M.E.	1901
Harlan, Clarence H.	C.E.	1906
Harley, John D.	M.E.	1908
Harlow, James H., Jr.	C.E.	1896
Harrer, Henry	E.E.	1895
Hartman, Charles M.	M.E.	1907
*Hartupee, Wm. Dilw.	M.E.	1873
Hay, Paul Liscomb	M.E.	1895
Hays, James W.	C.E.	1891
Haynes, Harold A.	E.E.	1910
Henrici, Frederick Wm.,	C.E.	1905
Herr, Andrew G.	Eng.	1901
*Herron, George K.	C.E.	1890
Hillman, John J., Jr.	Eng.	1901
Hindman, William S.	C.E.	1898
Hockensmith ,Wilbur D.,	M.E.	1901
Hoerr, Alexander L.	M.E.	1895
Hoffman, John W.	Eng.	1902
Hogg, David M.	M.E.	1903
Hoopes, Henry T.	E.E.	1897
Horne, George H.	E.E.	1907
Horner, Joseph T.	E.E.	1896
House, Edward B.	Eng.	1896
Howatt, John B.	Eng.	1893
Hunter, Harry M. L.	M.E.	1896
Hunter, Percy E.	M.E.	1895
Hunter, Samuel K.	C.E.	1900
Hurst, Oliver C.	M.E.	1898
Inglefield, Charles L.	E.E.	1908
Irwin, Lee S.	Eng.	1899
Isenthal, Leo Ralph	C.E.	1892
Jack, Wilbur Lee	Eng.	1896
Jamison, Richard H.	C.E.	1908
Jenkins, Jenks C.	C.E.	1888
Johnson, Frank F.	Eng.	1901
Johnston, Arthur S.	M.E.	1911
Johnston, Edward VanD.	M.E.	1897
Johnston, John P	C.E.	1890
Jones, Archibald R.	C.E.	1905
Jones, Lester B.	M.E.	1904
Junkin, Hays MacLean	M.E.	1904
Kammer, Glenn Donald	—	1912
Kanhofer, Walter G.	C.E.	1908
Kehew, Everette E.	Eng.	1894
Keller, Charles	C.E.	1879
Kelly, Henry E.	E.E.	1898
Keenan, Albert W.	C.E.	1908
Kier, Samuel M.	E.E.	1897
Kincaid, Charles W.	E.E.	1910
Kirker, Albert H.	M.E.	1895
Kiser, Alexander B.	E.E.	1897
Kissinger, George B.	C.E.	1908
Knight, Walter S.	M.E.	1905

Name	Degree	Class
Knopf, Julius R.	M.E.	1901
Knotts, William W.	M.E.	1910
Kramer, Frank P.	M.E.	1905
Kunkle, Charles E.	C.E.	1892
Lambie, Charles S.	C.E.	1900
Lambie, Joseph S.	C.E.	1907
Langenheim, Gustave G.,	C.E.	1890
Lauman, Walter H.	C.E.	1893
Layng, Frank R.	Eng.	1900
Libbey, James T.	C.E.	1904
Liggett, Dudley S.	C.E.	1891
Liggett, Sidney S.	Eng.	1897
Linn, Guy F.	M.E.	1902
Long, Frederick A.	C.E.	1909
Lowe, Harold C.	C.E.	1911
Lyons, James K.	C.E.	1887
Macfarren, Walter W. ..	M.E.	1895
Machesney, Harold B. ..	Eng.	1903
Magaw, Harry D.	M.E.	1908
Mannion, Mich. Francis ..	—	1912
Marsh, Howard G.	M.E.	1906
*Marshall, Thomas F. ..	C.E.	1858
Martin, James R. McI. ..	E.E.	1909
Maxwell, Robert G.	C.E.	1905
Mesta, George	C.E.	1885
Mesta, Lewis W.	M.E.	1911
Miles, J. Walter	C.E.	1892
Millar, William E.	C.E.	1910
Miller, Frank F.	M.E.	1901
Miller, John A. W.	M.E.	1901
Miller, John Hays	C.E.	1911
*Miller, Ralph W.	C.E.	1899
Mitchell, Lindsay LaC....	E.E.	1907
Mitchell, William H. ...	M.E.	1901
Mitchell, Wayne S.	E.E.	1906
Mohler, Ross Chester ..	M.E.	1908
Mollenhauer, Fred'k H. .	C.E.	1891
Moody, Wm. Falley	Eng.	1901
Moon, Charles S.	Eng.	1895
Moore, Jay R.	E.E.	1911
Morganstern, Ralph M.,	E.E.	1897
*Morley, Isaac	C.E.	1846
Mould, Edmund F.	Eng.	1899
Mueller, Richard Wm. ..	M.E.	1912
Mueller, Robert G.	M.E.	1910
Mueller, William F.	M.E.	1910
Mulheim, Charles B. ...	M.E.	1906
Munroe, Charles L.	Eng.	1900
Muntz, Richard	E.E.	1912
Murdock, William H. ...	Eng.	1901
Murray, William M.	C.E.	1907

Name	Degree	Class
Murry, John S.	C.E.	1899
Myler, Thomas K.	C.E.	1911
McCabe, Junius D.	C.E.	1884
McCabe, William P.	C.E.	1891
McCandless, William J...	C.E.	1909
McConnell, Malcom F. ..	M.E.	1902
McClelland, Robert T. ..	C.E.	1906
McCluskey, Wm. O., Jr...	C.E.	1912
McCormick, Roscoe T. ..	C.E.	1888
McCullough, Harvey V.,	C.E.	1896
McCullough, Ross	C.E.	1876
McCutcheon, Kenneth D.,	C.E.	1911
McCutcheon, Norman D.,	C.E.	1903
McDaniel, Wm. Lyle, Jr.,	C.E.	1912
McElhinney, John H. ...	M.E.	1909
McEwen, John A.	M.E.	1894
McFarland, James C.	C.E.	1905
McFeeters, Guy S.	C.E.	1909
McGrew, Anson B.	C.E.	1892
McGrew, John	C.E.	1891
McGurn, Jerome S.	E.E.	1909
McHenry, Thomas	C.E.	1904
McIntyre, Lewis Wedsel,	C.E.	1912
McIntyre, Elmer L.	C.E.	1909
McIntyre, John N.	C.E.	1905
McKee, Edwin B.	M.E.	1908
McKee, D. Gregg	E.E.	1895
McKean, Robert A.	C.E.	1886
McKenna, Roy C.	E.E.	1904
McKirdy, Charles W. ..	M.E.	1904
McMaster, Robert T. ...	C.E.	1896
Nagle, James C.	C.E.	1892
Neeld, Almos D.	C.E.	1875
Neeld, Almos D., Jr.	C.E.	1909
Neeld, Charles M.	C.E.	1896
Neeld, Robert E.	C.E.	1910
Neely, William R.	M.E.	1896
Neubert, Walter P.	E.E.	1894
Nevin, William C.	Eng.	1895
Nicholson, John H.	Eng.	1887
Noble, Howard A.	Eng.	1896
O'Hagan, Charles F.	C.E.	1900
Oleson, Walter E.	E.E.	1911
Orr, Almer H.	Eng.	1900
Page, Illtcd A.	M.E.	1904
Palmer, George B.	Eng.	1899
Parkinson, David I.	E.E.	1894
Parr, William P.	E.E.	1909
Partington, Joshua A. ..	M.E.	1905

Name	Degree	Class
Patterson, Peter C.	Eng.	1896
Paul, Earl W.	E.E.	1901
Pennington, Harley	M.E.	1899
Peterson, Albert A.	Eng.	1899
Plecker, May Burt	C.E.	1897
Piper, Theodore J.	C.E.	1907
Porter, James C.	Eng.	1896
Price, Edward K.	E.E.	1906
Price, David R.	E.E.	1908
*Price, Jesse B	C.E.	1894
*Price, Philip W.	C.E.	1899
*Purdy, William G.	C.E.	1892
Rall, Robert O.	M.E.	1905
Ramsey, Frank R.	C.E.	1902
Rankin, Harry H.	C.E.	1897
Ransom, George W.	E.E.	1901
Reed, Charles S.	E.E.	1911
Reed, James	C.E.	1870
Reid, Samuel	C.E.	1899
Reineman, Walter G.	C.E.	1905
Reizenstein, Harry S.	E.E.	1910
Renton, Thomas E., Jr.,	M.E.	1909
Renton, Walter C.	M.E.	1909
Reuter, William C.	M.E.	1906
Rhea, Frank C.	C.E.	1892
Richards, Harold E.	M.E.	1912
Richards, Robert W.	M.E.	1910
Richardson, Jos. Geo.	C.E.	1912
Ritchey, Charles W.	C.E.	1895
Ridinger, Charles W.	E.E.	1893
Riley, Albert D.	M.E.	1898
Risacher, Joseph L.	M.E.	1909
Robbins, Samuel	C.E.	1911
Roberts, Elijah R.	E.E.	1899
Roberts, James M.	C.E.	1910
Robinson, Parker M.	M.E.	1911
Roessing, Frank M.	E.E.	1900
Roessing, Lawrence W.	C.E.	1909
*Rogaliner, Morris L.	C.E.	1899
Rogaliner, Wm. L.	M.E.	1905
Rose, Chester F	Eng.	1907
Rose, George R.	C.E.	1892
Rosewell, Joseph T.	C.E.	1886
Rosser, Charles M.	E.E.	1904
Routh, Charles M.	M.E.	1908
Rudolph, Clyde A.	E.E.	1909
Russell, John W.	E.E.	1899
Rust, Frank, Jr.	Eng.	1896
Salkeld, Roy C.	C.E.	1908
Sapp, Edward H.	C.E.	1893
Schaeffer, James G.	M.E.	1905
Schaefer, Ralph G.	C.E.	1906
Schreiber, John W.	M.E.	1907
Schweppe, Walter	M.E.	1907
Scott, Walter C.	Eng.	1893
Seanor, Francis W.	M.E.	1911
Shaler, Edward C.	C.E.	1893
Shanor, Edgar E.	M.E.	1904
Shapiro, Harry	C.E.	1911
Sherbon, George E.	C.E.	1908
Shriver, Karl H.	C.E.	1908
Shrom, William G.	M.E.	1897
Sickman, Albert F.	C.E.	1878
Silliman, Guy F.	C.E.	1906
Simon, Richard	E.E.	1911
Singer, Edgar H.	C.E.	1911
Slaymaker, Philip K.	M.E.	1898
*Smith, John F.	C.E.	1892
Smith, J. Hammond	E.E.	1898
Smith, Kosciusko McC.,	E.E.	1908
Smith, Ralph Harold	C.E.	1912
Smith, Richard L.	C.E.	1888
Smith, Wm. A.	C.E.	1900
Smith, William R.	Eng.	1874
Spencer, Stewart C.	Eng.	1896
Sperling, George E.	C.E.	1898
Stackhouse, Raymond C.,	E.E.	1907
Steel, Gardner	Eng.	1895
Stern, Walter R.	C.E.	1912
Stein, Adam, Jr.	E.E.	1903
Stewart, Charles A.	Eng.	1874
Stewart, Reid T.	C.E.	1885
*Stilley, Edward J.	C.E.	1846
Stoner, Frank R.	Eng.	1887
Strassburger, Daniel S.,	C.E.	1896
Stuebner, Ruben	C.E.	1905
Sulzner, George T.	Eng.	1902
Supplee, Charles W.	C.E.	1909
Swan, John, Jr.	Eng.	1893
Swan, Robert	C.E.	1879
Tanner, J. Roy	Eng.	1896
Taylor, Allen R.	C.E.	1910
Taylor, Charles E.	C.E.	1904
Taylor, Ernest S.	C.E.	1906
Taylor, John L.	C.E.	1898
Taylor, Samuel A.	C.E.	1887
Terbush, Clifford C.	C.E.	1907
Thomas, Bennett T.	C.E.	1909
Thomas, Edwin L.	Eng.	1899
Thomson, Robert W.	E.E.	1907
Todd, George C.	C.E.	1903
Trees, Joseph Clifton	C.E.	1895
Trimble, Alexander F.	C.E.	1897
Trimble, Robert	Eng.	1875
Truxall, Edward L.	M.E.	1906

Name	Degree	Class
Turner, Charles A.	E.E.	1908
Turner, George F.	C.E.	1903
Turner, Howard Q.	Eng.	1893
Van Blarcom, Conant	M.E.	1907
Vandivort, Samuel E.	C.E.	1908
Voelker, Aloys	C.E.	1910
Waggoner, Charles W.	C.E.	1903
Wagner, Gustave E. T.	M.E.	1904
Wahr, Harry F.	M.E.	1903
Wallace, Frederick J.	M.E.	1909
Wallace, Richard W.	E.E.	1902
Ward, Charles A.	M.E.	1900
Warne, Charles C.	M.E.	1903
Watt, Herman E.	M.E.	1901
Weber, John, Jr.	M.E.	1909
Weeks, Alfred B.	M.E.	1904
Weldin, William A.	C.E.	1902
Weldin, Walter J.	C.E.	1906

Name	Degree	Class
Werner, Edward H.	M.E.	1906
Wetzel, Walter C.	E.E.	1907
Whyte, Robert	M.E.	1906
Wilcox, Homer G.	C.E.	1912
Wilde, Herbert K.	C.E.	1897
Wiley, James G.	C.E.	1902
Willock, Roy Leech	M.E.	1909
Willock, Sylvester R.	M.E.	1905
Wilson, Albert J. E., Jr.	C.E.	1906
Wilson, Henry M.	M.E.	1895
Wittmer, George, Jr.	M.E.	1892
Wittmer, Thomas	Eng.	1896
Woodson, Howard D.	C.E.	1899
Woolridge, Charles L.	Eng.	1897
Worcester, Winthrop S.	E.E.	1903
Wuth, Wm. B.	Eng.	1899
Wylie, Thomas B.	Eng.	1893
Wynne, Arthur V.	Eng.	1910
Wynne, Clarence B.	Eng.	1906
Young, Roy A.	Eng.	1910

UNIVERSITY OF PITTSBURGH

BULLETIN

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